THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
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A MODEL METAL CASTING SHOP OF THE NAUGATUCK VALLEY

By Guion Thompson.*

About the first of the year 1909 a large brass company put into operation a large general casting shop in Waterbury, Conn., and abandoned the various small casting shops in its branch mills, making all castings in the new shops and delivering them to the branch mills by horse and motor trucks and especially constructed steel railroad cars.

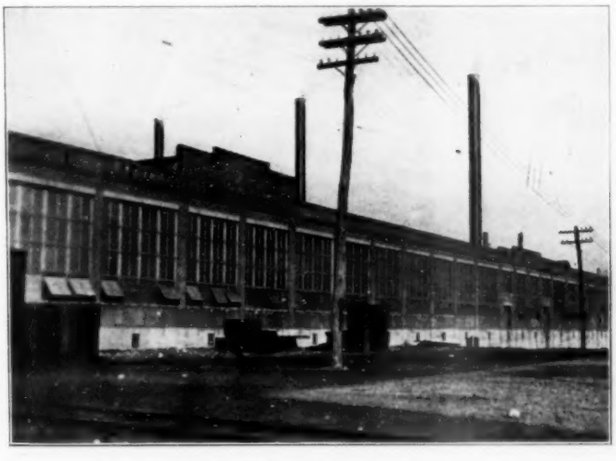
Studies were made of old casting shops, opinions of old casters obtained and discussions carried on between casters and engineers for months before the new shops were built, for the purpose of determining the advisability of this and that proposed improvement in methods of handling the work. The general building plan as finally adopted and built is shown in Fig. 1, and in Fig. 2 is a typical cross section looking south through the group of buildings composing these shops. In the plan is shown in dotted lines an addition to the north of the metal storage building made in 1912 and which is not yet fully equipped and will not here be described.

All the buildings are of brick, steel, concrete, tile and glass, and there is nothing of a combustible nature anywhere in the plant except the fuel for the fires and the insulation on the electrical apparatus. Foundations, cellar walls and floors are of concrete, and the frame is of steel with special steel roof trusses, the lower chord of which is composed of two channel irons, while the rest of the truss is of angles. Columns and trusses are spaced on 20-foot centers and the side walls of the two casting shops are brick from the foundations to about 5 feet above the floor. Above this wall, long vertically hinged steel shutters extending from pilaster to pilaster with a section of glass about 6 feet wide extending along over the top of these shutters to the truss line, above which is a brick parapet wall. The shutters are connected with an opening and closing mechanism operating three panels in unison.

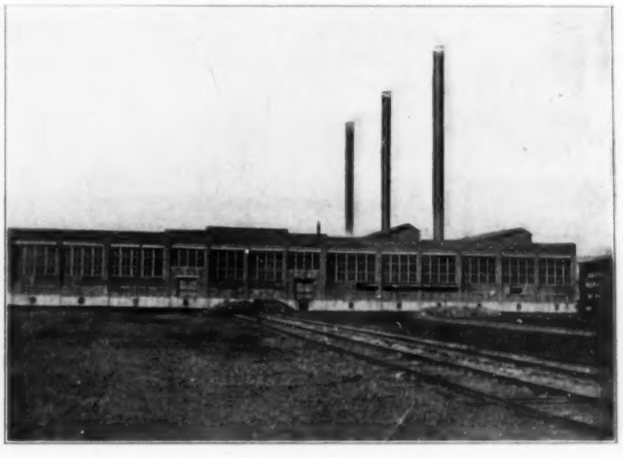
The walls of the metal storage building, north and south passways and the ash reclaiming plant are of the same general construction, except that the steel shutters are omitted and permanently built-in glass panels substituted. In the metal storage building west wall the brick extends above the floor line about 12 feet. In the glass panels in these buildings, sash are hinged along the lower edge, each pivoted horizontally on its center and connected with an operating mechanism for opening and closing, in order to procure ventilation.

The side walls of the monitors over the casting shops and wash rooms, etc., are composed of vertically hinged steel shutters connected to an opening and closing mechanism operated from the main floor. The monitor roofs are of clay and glass tile and the main building roofs are of tar and gravel over hollow tile laid between Tee section steel purlins. The rain-shed is carried off by gutters at the parapet wall and through copper leader pipes carried down inside the building walls to sewers emptying into a canal south of the buildings.

The pendant construction attached to the casting shop roof trusses, indicated in Fig. 2, is for the purpose of supporting a crane runway over the fires and molds.



SOUTH SIDE LOOKING NORTHEAST.



SOUTH WALL LOOKING NORTH.

TWO VIEWS OF THE OUTSIDE OF THE MAMMOTH CASTING SHOP AT WATERBURY, CONN.

*Consulting engineer, Waterbury, Conn.

Small hand operated bridge cranes, with motor driven hoists, were at first installed on these runways, but the fumes from the fires and crucibles caused so much trouble with the electrical parts that hand operated hoists were substituted. At the present time these pot and mold handling cranes consist of the original cranes, the electrical hoisting apparatus having been replaced by a block and fall tackle, which has a pole attached to it by means of a Universal joint. The caster's helper moves the crane and its load about over the fires and mold pits by means of this pole, the tackle line coming down from the upper block to a belaying cleat mounted just above the lower end of the pole.

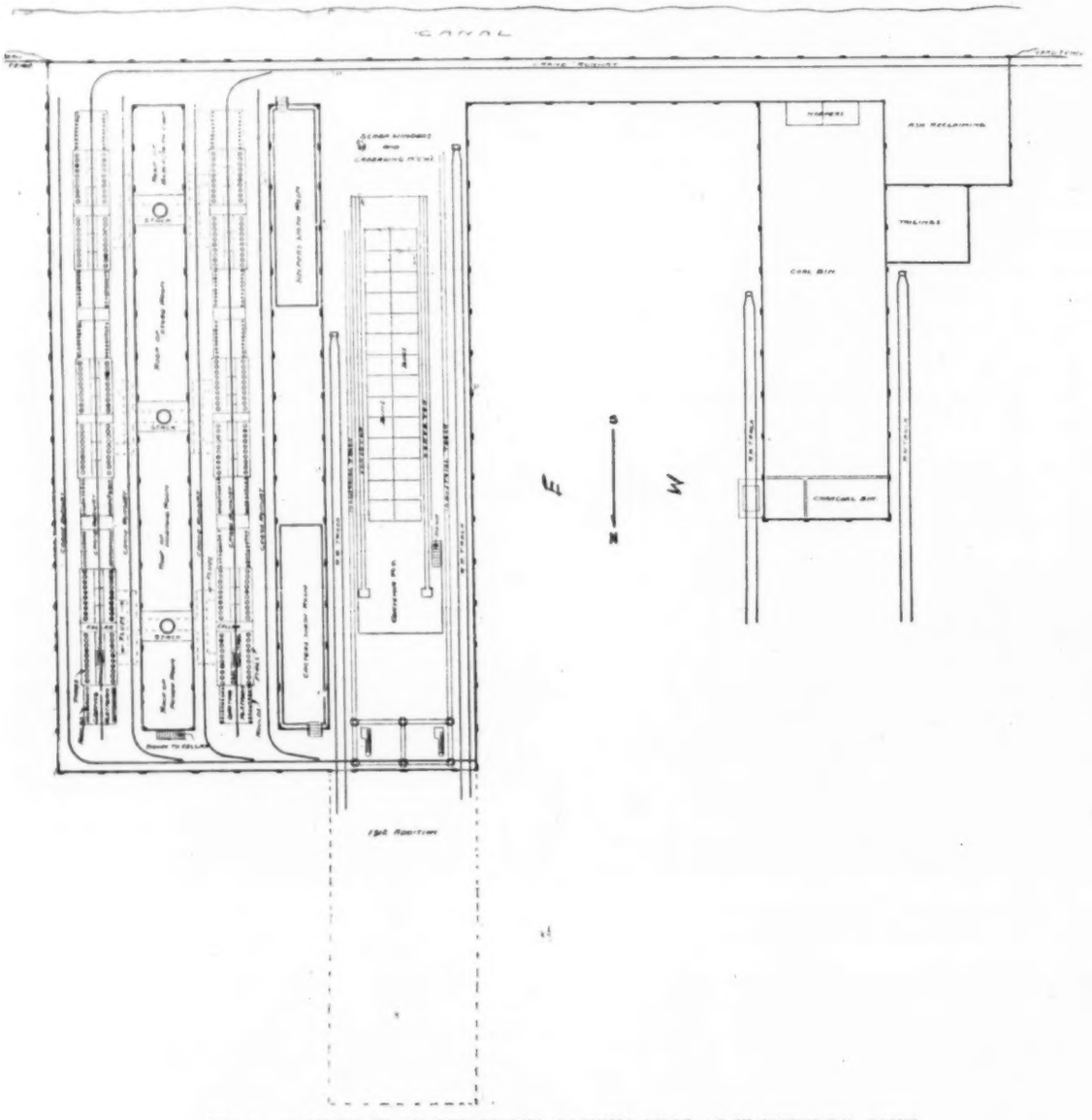


FIG. 1. PLAN VIEW OF THE MODEL CASTING SHOP AT WATERBURY, CONN.

ARRANGEMENT OF FIRES AND MOLDS.

The arrangement of fires and molds in the two casting shops are shown in Fig. 1. In each shop there are three sets, or groups, of fires and molds connected to each stack. There are three of these stacks between the two shops, and they are self-supporting steel stacks, each 6 feet in diameter by 125 feet high. These groups, or sets, of fires and molds are sub-divided into two secondary groups consisting of a row of ten fires and ten molds each side of the center line of the shop, making in all twenty fires and twenty molds to each such subdivision of the group, each shop containing in all one hundred and twenty fires and one hundred and twenty molds. All groups of fires and molds are exact duplicates of each other, there being a double row of fires in the center of each group, and at each end of such group of fires a double row of molds.

Each group of fires is divided by an alley through the furnace on the cellar floor level and there is an 8-foot alleyway over which the main floor is omitted between the end of the row of molds of one group and that of the next group, this space being open to the cellar floor and used for the lifting out of ashes by the monorail cranes passing directly overhead.

The main floor is also omitted between the rows of molds and a grating platform built in this space about half-way between the main and cellar floor levels. There is a drain in the cellar floor directly under this grating for the purpose of carrying off waste water used in cooling the molds. The ashes are removed

from the fires through doors in the sides of the concrete furnace structure at the cellar floor level and loaded into the ash buckets left in the alleyways by the cranes which later remove them to the ash reclaiming plant.

The fires are supplied with fuel from above and the crucibles lowered into the furnaces in the usual manner, the opening in the furnace top having the common type of sliding cover. Between the rows of fires in each half group are three sheet steel bins, the one in the center being used for charcoal and those at each end for coal. They are open on top and have small openings in both sides at the bottom with a shelf, or lip, extending beyond the sides just below these openings, to hold back, and from which to shovel the coal coming through these open ports by gravity from the bin. Coal can thus be taken from either side of any bin for either row of fires.

Cannon type molds are used, trunnioned at their centers about 1 foot above the main floor level and each unit takes one complete crucible charge, casting one or more rods or plates, according to their size.

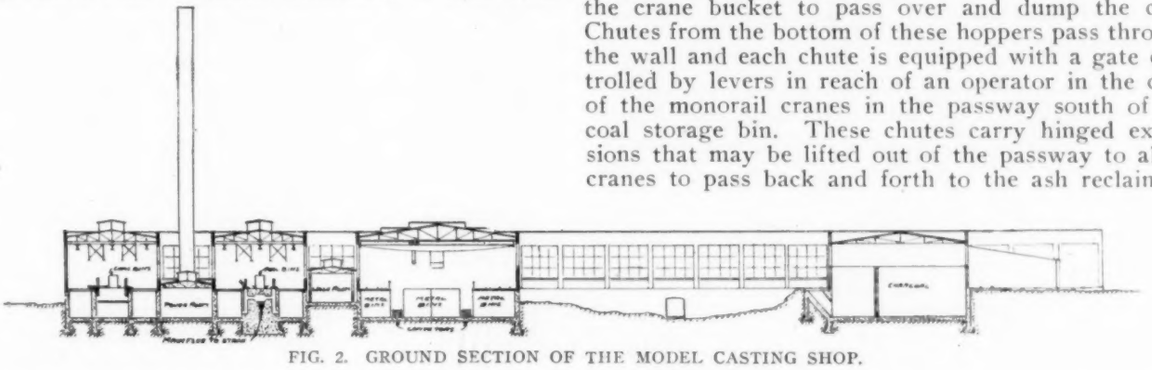


FIG. 2. GROUND SECTION OF THE MODEL CASTING SHOP.

The molds for plates are made up of longitudinal sections clamped together, two sections forming the outside sides carrying the trunnions and the other sections forming partitions, or division walls, dividing the complete unit into one or more mold forms. The lower ends of the molds are plugged, a throughpin holding the plugs in place, and the upper ends carry a gang of funnels cast in one piece and hinged to lugs at one side of the mold.

The metal is poured by means of the cranes described elsewhere and the usual crucible tongs. When cooled sufficiently the molds are tipped over with the top ends over the main floor and the bottom ends toward or over the center of the mold pits. An operator on the mold pit grating removes the pins retaining the bottom plugs and, by a sharp blow with a heavy hammer on the protruding ends of these plugs, starts the cast metal out of the top of the mold, from which it is completely removed by grasping the protruding ends with tongs and drawing out on the floor, from where it is loaded directly into the carriers, or slings, and then removed by the cranes. As many as three plates or rods are cast side by side in one mold, without trouble, at the present time, though quite a little experimenting was necessary to overcome the troubles due to unequal expansion and contraction in the first molds that were built. Each mold pit is supplied with water and compressed air for cooling and cleaning purposes. The compressed air is piped from the mill compressors and the water supply is obtained from the casting shops well, as later explained.

HANDLING OF THE FUEL.

The coal pocket between the metal storage building and the ash reclaiming plant in Figs. 1 and 2 is of steel and concrete with a tar and gravel roof, as before explained. The floor is at the same elevation as the casting shops' cellar floor and the side walls extend above the ground level about 15 feet. From this point to the roof the walls are omitted between the pilasters. The walls of this building are of reinforced concrete throughout. In the northwest corner a charcoal bin is partitioned off from the main coal storage bin and in the northeast corner is another partitioned off pocket into which coal from cars standing on the track outside comes through a chute into which the cars dump. The coal is taken by crane from this receiving pocket and distributed in the main storage bin. The crane is a bridge crane with a cage attached to and traveling back and forth with the trolley. A clam-shell type bucket is used.

Supported across the south wall of the coal bin are two sheet steel hoppers high above the floor, there being just clearance enough above the top of them for the crane bucket to pass over and dump the coal. Chutes from the bottom of these hoppers pass through the wall and each chute is equipped with a gate controlled by levers in reach of an operator in the cage of the monorail cranes in the passway south of the coal storage bin. These chutes carry hinged extensions that may be lifted out of the passway to allow cranes to pass back and forth to the ash reclaiming plant, which is just beyond the coal storage bin. When these chutes are let down, in order to deliver coal to a bucket suspended from a crane standing in the passway, they are diagonally across the passage, the craneway being on the south side. An opening is left in the floor at a point where the chutes deliver the coal into the buckets, in order that the buckets may be lowered below the floor level and waste coal may fall through and not accumulate on the main floor.

(To be continued.)

SPELTER PRODUCTION IN 1912.

The production of spelter in the United States in 1912 is placed at 338,806 net tons, in a folder issued by C. E. Siebenthal, of the United States Geological Survey. This compares with a production of 286,526 tons in 1911, thus showing an increase of 52,280 tons. The figures apply to primary spelter which is made directly from ore, secondary spelter being recovered from such sources as drosses, skimmings and old metals. The production of secondary spelter in the United States in 1912 was about 53,300 net tons, against 43,736 tons in 1911. The folder gives the production of spelter in the world in 1912 as 1,063,121 net tons, against 978,695 tons in 1911, being an increase of 84,426 tons. Names and locations of producers of spelter are also given, with the number of retorts operated by each at the close of 1912 and a list of those now in course of building. It also includes price and production curves covering the years 1906 to 1912, inclusive.

SOME AIDS TO SCIENTIFIC MANAGEMENT IN THE FOUNDRY *

By W. M. Corse.†

One of the first steps in the scientific management of a plant is to plan out a proper organization. This gives every one a base from which to start and clarifies the atmosphere of petty jealousies and misunderstandings. With this organization chart before us, we can follow out the various departments, and finally perfect a harmonious working whole.

My own plan is to start a system of factory records, in order that the management may have written information of the happenings in the shop at the present time and a record for the future. These may be daily, weekly or monthly reports, and should serve to furnish information that will give a mental picture of affairs in a concise manner. We should have these records immediate, adequate and permanent.

I shall attempt to describe some of the records I have used with success in a brass foundry. I do not say that these are all that are needed, or that better cannot be found for special cases, but simply that those mentioned will aid the manager to see more clearly the conditions with which he has to contend daily.

The first and most difficult report to keep accurately, is that of the metal melted and of the output. We may call it the metal report or practice sheet. To secure positive results it is wise to have a separate room in which to store the daily supply of metal for the various mixtures and the shop scrap from each alloy produced. These should be kept in separate bins or boxes, properly marked with the alloy number, so that errors in weighing can be minimized. As many alloys look similar in outward appearance, great care should be exercised first in taking the castings from the foundry to the cleaning room, and next in taking the gates and risers and defective castings from the cleaning room and inspection departments. In this case, as in all movements of goods in process, the arrangement of the various departments should be such that the metal moves in a direction that does not cross or back-track other metal. The tagging of alloys that cannot be readily picked out by their appearance will aid materially in keeping this record accurate. The progressive jobbing foundry will frequently have twenty-five standard alloys, as well as a large number of special mixtures. Let us follow the progress of the metal and note the steps in the process.

FOLLOWING THE RAW MATERIAL.

First, the storekeeper weighs out the bulk metals to the foundry metal room, receiving in return a signed requisition from the weighmaster. This requisition serves as a check on the store records and aids the purchasing department in balancing the materials account with the accounting department at the end of the month. Secondly, the weighmaster weighs out the various amounts of new metals and shop scrap for the mixtures ordered by the furnace department, using the daily working formula given to him by the metallurgist in charge of the laboratory. Before delivering the mixtures to the furnace department, the weighmaster should record on a special ruled sheet the alloy number, furnace number, and the weights of the constituent metals. At the end of the day this sheet goes to the metallurgist to be checked, and from there to the cost office for compilation. The totals of these daily sheets for a week give the amount of each alloy charged to the furnace department, and when credited with the amount remaining at the end of the week, shows the metal melted for that period. They show not only the amount of the various constituents used in each alloy, but also the total of each metal used for the week. They further show exactly what each furnace is producing. This information can be used for determining the consumption of metal and gives the purchasing department an accurate figure on which to base future purchases for the maintenance of sufficient stock for the orders on hand. It would hardly seem necessary to draw attention to this record, but I have often been surprised to find that no such information is available in many large foundries.

CHECKING UP THE METAL LOSSES.

We now have figures on our weekly summary sheet which may be said to constitute the debit side of the account. The credit side of the account consists of the output of the foundry, divided into ingot metal, good castings, bad castings, gates, risers and recovered metal. They are weighed by the inspection department, the first three coming from the inspection department itself, the fourth from the cleaning room, and the fifth from the recovery department. They are separated first by day's work, then by alloys. Subtracting the output of each alloy from the metal charged to the furnace department, will give the gross loss of each mixture and the difference of the totals the gross loss of the foundry for the week.

The net loss is figured at the end of any period by assaying recovered metal too fine to be returned direct to the foundry, from the metal recovery department, figuring the weight of metal recovered and subtracting it from the gross loss. For cost purposes the net loss by weight cannot be used because the recovered metal cannot be sold for its full value to the smelter. We therefore estimate the value of the metal melted for the period in question, divide it into the amount received from the smelter for the recovered metal, thus arriving at the percentage of the recovered metal. This is subtracted from the gross percentage loss to be added to the formula cost of the alloy. This is not strictly accurate in that the gross percentage loss by weight may not represent the formula cost of the new metal, but as the more volatile metals are usually the cheaper, the error is on the safe side.

CHARGING UP THE LOSSES.

Let us take an example, viz.: The new metal may consist of 85 parts copper, 5 parts tin, 5 parts lead and 5 parts zinc. This would cost on the basis of 50-cent tin, 4½-cent lead, 15-cent copper and 7-cent zinc, about 15.82 cents a pound. If we are making ingot metal, we would add the approximate net loss of 3 per cent., determined as outlined above, or .47c. to 15.82c., giving us 16.29c. as the cost of the metals constituting the alloy.

The fact that such a figure does not give the cost of the alloy in the castings is frequently overlooked in cost accounting. Let us see why this figure cannot be used estimating the cost of castings. If we melt 100 lbs. of metal, we may assume in ordinary brass foundry practice that we will net about 45 pounds of good castings. It is apparent that 100 lbs. of metal cost in the formula 15.82c. and that we lose 3 lbs. valued at .47c. Therefore, 45 lbs. of good castings would cost 45 × 15.82, or $7.13. Figuring the loss on the value of the good castings we get .47 ÷ 7.13 or 6.6 per cent. The metal in the castings, therefore, costs 15.82. (6.6 per cent. of 15.82) or 15.82 + 1.04 = 16.86c. per lb. An easy way to determine the amount to be added for loss is to divide 100 by the per-

*Paper read before Pittsburgh Foundrymen's Association, March 10, 1913.
†Works Manager, Lumen Bearing Company, Buffalo, N. Y.

centage of good castings produced, in this case 45 per cent., giving a factor of 2.2. Multiplying the net loss of 3 per cent. by the factor 2.2 we get 6.6 per cent., which is the same as we determined by the other method. We have now found by the use of the metal report or metal practice sheet, a means of checking the store records, the amount of metal melted, the output and the factors to be used in figuring the value of the metal for cost purposes.

You will agree that these are all essential figures and also that we have determined one of the three elements of any cost, viz.: Material. The other two elements, labor and expense, are determined by any of the accepted methods of cost accounting.

THE DAILY CASTING REPORT.

The second record of importance is the daily casting report. The first essential for this report is to have every day's work kept absolutely separate in all departments handling the castings, except the shipping room. There are many advantages in keeping the day's work separate, which pay for the extra labor involved. As soon as the castings are shaken out they are checked for count and customer's name by the foundry clerk and sent to the cleaning room. This record is made in duplicate in the left hand columns of the report and a copy goes to the production clerk, who records the number of pieces made on the shop order, which is a copy of the customer's original order. This in turn enables the production department to keep in close touch with the orders in process. As the castings come from the cleaning room, they are examined in the inspection department and the weight and count of good and bad pieces noted. The good castings pass directly to the shipping department; while the defective pieces are sorted by pattern number and by molders' numbers, on a bench set apart for the purpose.

INSPECTING BAD CASTINGS.

When the day's work is all inspected, the foundry superintendent and factory engineer go over each lot of defectives and note the causes of defect. This serves to furnish information for the immediate correction of excessive losses. We all know that one of the big leaks in any foundry is the amount of bad castings, so that the relatively small amount of time spent in their examination will surely lead to large savings. It is surprising how frequently this examination is casual, instead of systematic, and it generally needs a cost record to emphasize the amount of the loss through defective castings before much attention is paid to this feature. A bonus paid to the foremen when the percentage of defectives drops below a stated amount, will often stimulate interest in this matter.

The inspection department records the number and weight of the good and bad pieces opposite the count noted by the foundry clerk on the daily casting report and the percentage of defectives, by pieces, is calculated. This report is arranged by molder's number so that it will show the foundry superintendent and factory engineer the quality of work being turned out by each molder. A compilation of the daily reports for the week will show the percentage of loss by each molder, and the weight of castings produced. The latter when divided by the number of working hours will show the pounds produced per molder per day for the week. This serves as an excellent check on each molder's efficiency.

Another compilation will show the total castings produced per alloy by weight and pieces, and also the total weight and pieces for the week. This is the source of part of the information regarding output which was mentioned under the metal report in the first part of the paper. From the total weight and pieces is figured the average weight of the castings produced and the total defective loss in percentage by weight and pieces. This gives a good general idea of the efficiency of the foundry department, when taken in connection with average pounds produced per molder per day.

TIME CARDS FOR EACH JOB.

You will see that a careful study of the reports as described will give a good general view of the conditions in the foundry. If one wishes, the results may be plotted on a graphic chart which will show these conditions at a glance more effectively than a report consisting of figures only. When a job is of sufficient length to make it advisable, the record of the defectives may be kept on cards arranged by pattern numbers. The average of a period points out the excessive defectives and indicates the patterns to be improved immediately, in order to gain maximum benefits.

The third set of records that I might mention are the individual cards showing the exact time spent on each job. On these cards are entered the weight and count taken from the daily casting reports, thus giving a complete record of the job to be used as a basis for figuring its cost. The various items of expense chargeable to each job are taken from the expense analysis of the month preceding. This expense analysis is made up from the payroll, which has been subdivided by job or standing plant order numbers, and the various items of expense are taken from the store room requisitions and the voucher register in the accounting department.

SUMMARY.

To summarize we have the sources of information for the three items of cost, viz.: Material, labor and expense.

FIRST—The metal report which gives the cost of material.

SECOND—The individual cost cards which give the labor on each job.

THIRD—The expense analysis which gives the items of expense chargeable to each hour of productive labor or each pound of castings produced, depending on which method is followed in figuring the expense in the department in question.

In order to scientifically manage any business, the basic facts which underlie it must be known. As a step in this direction, the reports mentioned above will serve to give fairly complete information. Many others can be added to give specific information, such as figuring piece work rates and standard time and bonus rates, but these should, in my opinion, follow those first mentioned. I have tried to outline the use to be made of a few principal reports with a view of stimulating interest in securing accurate information. It is only by this means, I believe, that the so-called scientific management can be introduced in a foundry. After a year or two the more complex methods of pay and performance can be added, but I think the mistake may be made by trying to introduce too much at first, thus causing confusion and distrust on the part of all who should reap the most benefit from a perfected system of cost and efficiency. If the interest mentioned has been aroused by the description of the reports used in our foundry, the purpose of this paper will have been accomplished.

HOW TO MAKE ASPHALT LACQUER.

Asphalt lacquer is made by dissolving Syrian asphalt in benzole to the proper consistency. Benzine or gasoline is frequently used as a thinner.

THE BRONZE FINISHES

By Oscar A. Hillman.*

The bronze finishes are so inseparably linked with all that stands for progressive civilization that the word "bronze" awakens in the mind suggestions of competitive struggles, heroic deeds, art and antiquity. Yet, with unflagging public favor on their side, the bronzes are given very little attention by electro-platers and chemists in general. The application of a bronze finish on an article is a matter for careful study in order that the one most appropriate shall be made use of. The safest rule is to study the motif of the article, whether it is a medal, tablet or gas lamp, and, after knowing what the artist had in mind when he designed it, apply the finish that will harmonize with his thought and enhance the beauty and value of the whole.

OXIDIZED BRONZE.

Oxidized bronze is very simple to produce and is used extensively on builders' hardware, lamps, metal furniture, and, in fact, almost anything that can be copper plated. When an article is to be finished in oxidized bronze it should be copper plated as usual, then blackened in a warm dip made by dissolving one ounce of liver of sulphur in five gallons of warm water. When the dip gets too old to work properly, it may be rejuvenated by adding a small quantity of aqua ammonia and increasing the temperature. After the article is blackened and rinsed off, the high lights should be toned off with fine pumice until the desired effect is produced, then the article should be washed, dried and lacquered before the exposed copper has time to tarnish.

OXIDIZE FINISH ON BRASS.

THE BROWN BRONZES.

The brown bronzes are almost exclusively used for medals, loving cups, busts, military buttons and badges. To finish an article in any shade of bronze from a light nut color to dark chocolate, proceed as follows:

Prepare a dip by dissolving C. P. sulphate of copper in boiling water, using four ounces of the sulphate for each gallon of water. Copper plate the article lightly, rinse in cold water, then dip for a few seconds in the bronzing dip, rinse in hot water and dry in hot sawdust. After the article is dry, it should be scratch-brushed very lightly, using a brush with fine steel wires, run not over 2,000

BRONZE FINISH ON BRASS.

r.p.m. It often happens that the bronze looks patchy or spotted after the article is dry scratch-brushed the first time, but if the dip and brushing is repeated a uniform color will result. The shade of color can be changed from dark yellow to chocolate by varying the amount of sulphate of copper used and the length of time the work is boiled in the dip.

The dip must be boiled over a gas burner or charcoal fire as it will not work unless in actual ebullition, and as it decomposes very rapidly, it should not be allowed to boil until a batch of work is all ready to be bronzed. If the work comes out of the dip with a green or blue sheen it denotes the presence of zinc in the copper plating solution and it becomes necessary to pass the work through a dip made of equal parts of oil of vitriol and water before using the bronzing dip. When finishing large busts or plaques in dark brown, the addition of a small amount of sulphide of antimony proves effective.

THE PRICE BRONZE.

This beautiful red bronze is used principally for badges, buttons and letters for indoor signs. It is produced by copper plating the articles as usual, then sandblasting them with very fine sand, then bronzing in the brown bronze dip until a dark brown is obtained. Instead of scratch-brushing the work, it should be brushed with a soft hand brush charged with red oxide of lead until the fine matte is filled, giving the work a color that is durable and permanent. A number of interesting effects can be produced by using various proportions of yellow pigment and electrotypers' graphite in conjunction with the red lead.

THE VERDE ANTIQUE OR VERDIGRIS BRONZE.

The finish that is applied the most and understood the least by mediocre platers in general is, without a doubt, the verde antique or verdigris bronze. If properly handled it is beautiful, durable, easy to produce and is appropriate for a large variety of work. The greatest objection to its use is that the patina formed or the pigments used to imitate a true patina are always more or less—sometimes—deadly poisonous. Large castings of bronze metal or copper should be sprayed or painted with the following solution:

Acetic acid	4 ounces.
Acetate of copper	2 "
Sulphate of zinc	1 ounce.
Common salt	1 "
Water	1 gallon.

VERDE ANTIQUE FINISH.

If the solution dries off and the article turns dark brown without the formation of patina, the spraying or painting should be repeated. If the patina shows a tendency to peel or form in flakes, a little acetin should be added to the solution. After the patina has formed the article should be relieved, then warmed and waxed or oiled as usual; never lacquered.

All work that is small enough to be wired up or plated on racks should be copper plated as usual, then oxidized in a hot solution containing two ounces of white arsenic (arsenic trioxide) and four ounces of cyanide of potash per gallon. If the arsenic solution is to be used as soon as it is made, the addition of two or three ounces of caustic soda will hasten its action, but as it causes the solution to give off its deadly poisonous fumes in larger quantities, thereby jeopardizing the health of the workman, the use of caustic soda cannot be recommended unless the fumes can be taken care of.

*Electro-Chemist, Attleboro, Mass.

After the background is applied, the articles should be rinsed in cold water, then the patina plated on in a cold solution made by using four ounces of bichromate of potash and three ounces of sulphate of copper for every gallon of solution required. To obtain the best results from this solution, it should be used with a high voltage (eight to sixteen) and an abundance of carbon anodes. After the patina is formed, the work should be taken out of the solution and (without rinsing) rubbed off with a hard cloth so as to rub the patina off the high parts and let it settle in the background. After the solution has dried on the articles they should be rubbed off with flour of pumice, then heated and waxed or oiled. If the patina has a tendency to assume a yellowish tone, the articles may be dipped in lacquer thinner to which has been added a slight amount of blue printers' ink mixed with a few drops of lacquer. The colored lacquer thinner dries immediately and does not interfere with the final operations of rubbing off and waxing. A beautiful finish can be produced by coloring in the brown bronze dip for a background, then in the green patina solution and finishing as usual. Some paper cutters, like the ones illustrated, were finished over eight months ago and although they were not dacquered or waxed, and have been handled pretty roughly, the beauty of both the brown background and the green patina has increased, rather than diminished.

EXAMPLE OF RED BRONZE.

It may be of interest to platers to know that that most arbitrary of metals, aluminum, can be plated in the bichromate of potash solution the same as brass or copper. The aluminum bag tag illustrated was plated last spring and the finish is all that could be desired, except where it has worn off on the edges. Cast-iron can also be bronzed without previously copper plating. If a red rust, together with the green is desired, acetate of copper should be substituted for the sulphate. The addition of a little carbonate of soda or carbonate of ammonia yields a bluish patina.

ROYAL COPPER BRONZE.

There are several methods of producing the royal copper bronze, but after repeated experiments, covering a period of over fourteen years the writer gives the one below as the most simple and reliable. Copper plate the articles as usual, then bronze them in the brown dip until a uniform color is obtained (it makes no difference if the brown bronze is light or dark, but it must be uniform), then dry scratch-brush, dip in a weak potash or "Kalye" dip, rinse in cold water, dip in clean wood alcohol and dry in sawdust without touching the articles with bare hands. After the articles are dry they must be handled with cotton gloves or finger stains are sure to show on the finished work.

To obtain the bright red color the articles should be taken from the sawdust and dipped in boiling salt petre (nitrate of potash) for a few seconds, then plunged at once (without rinsing) in a boiling slush of bi-carbonate of soda and water for about thirty seconds, then rinsed in hot water and dried. The bright red color is brought out by polishing the dark oxide off, using a soft muslin buff charged with jewelers' crocus. To lighten the shade of red, mix a little carbonate of soda with the salt petre before it is melted; to darken, mix carbonate of lead. The salt petre must be boiled over a gas burner that is powerful enough to heat the bottom of the iron pot a dull red; it must never be boiled over a charcoal fire, as the sparks and unburnt gases will make a serious explosion almost inevitable. It must always be borne in mind that it is perfectly safe to heat salt petre to the melting point, but if any carbon (soot, charcoal, etc.) or any organic substance that the heat can convert into carbon (as sawdust, paper, etc.) should come in contact with it, an explosion will result.

FALSE BRONZES.

There are several formulæ for the brown bronze finishes that call for a chloride as the bronzing agent, usually chlorate of potash or sal ammoniac, but as all solutions that contain a chloride or an acetate are incapable of producing a permanent brown, the color obtained is merely a stain that will speedily turn iridescent, then black.

CONDENSER TUBES.

A number of interesting papers have been presented before the British Institute of Metals, among which should be particularly mentioned "The Corrosion of Brass Condenser Tubes," by Mr. Paul T. Bruhl.* This paper is the result of a thorough study of this troublesome problem and brings out certain very interesting conclusions arrived at by the author. "In this connection, attention should be called," says Carl F. Woods, of the staff of Arthur D. Little, Inc., chemists and engineers of Boston, "to the proceedings and the report of the corrosion committee of the institute which was opened a year ago with a view to carrying out an exhaustive and authentic research on the corrosion of brass and bronze.

The committee have decided to erect in Liverpool a plant in which the conditions of marine condenser service should be as closely imitated as possible. The plant is to consist essentially of four cast iron tubes each fitted with tube plates to carry 12 condenser tubes, these iron tubes representing four small independent condensers. The condensers will be connected direct to the exhaust of a small engine which in turn will drive a circulating and vacuum pump for circulating sea water through the condensers. Each condenser will be fitted with the same kind of tubes and the committee has decided for the first set that one condenser shall be equipped with the so-called "Admiralty" mixture with a tube plate of naval brass, the equipment being carried out with the same extreme care insisted upon by the "Admiralty" practice.

The second condenser will represent the best class of commercial practice, the tubes being 70-30 mixture and the plates of yellow metal. The exact equipment of the other two condensers had not been decided upon at the time of the committee's progress report but they will be compositions representative of commercial practice. The results obtained from careful experiments carried out in this way should be of the utmost value as it should be possible to practically duplicate service conditions and at the same time to control the various conflicting conditions in such a way as to arrive at definite well-founded conclusions."

*THE METAL INDUSTRY, October-November-December, 1911.

ANNEALING MUFFLES*

A Resume of the Best English Practice in Annealing Metals.

By C. H. Wall.†

The subject of annealing muffles is one of great importance, especially to manufacturers engaged in those trades where the annealing of the metal is required so many times during the process of manufacturing the article from the crude to its finished state. In the brass, copper and alloyed metal trades the subject of annealing originally received but scant attention, as most of the older type of muffles go to show, their construction being of a crude and bad design; generally they were end-fired with a fire-box oftentimes twice the size necessary to do the work; a counter arch being constructed over which the flame passed, the metal to be annealed lying on the bed of the muffle beneath. The flame passed through flues on either side at the end of the muffle, into one flue away to the stack. With such large fire-boxes to a comparatively small bed area the combustion was, as a rule, very incomplete, the flame having only the length of the muffle bed to travel before passing away into the flue to the chimney, a large quantity of carbon was unconsumed, and heat being thus lost to the muffle, as often a greater heat was found in the flue from which no useful effect was obtained. The type of such a muffle as above described is illustrated in Fig. 1.

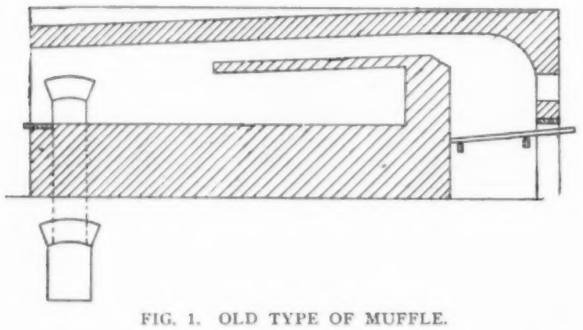


FIG. 1. OLD TYPE OF MUFFLE.

Of late years the direct firing of muffles has received more careful attention, especially as science and practical experience have taught manufacturers a lesson, and coal costing more money, they have had to consider the best ways and means of keeping their annealing costs down on the one hand, whilst the advance of science has shown that, by properly designed muffles, the maximum of metal to be annealed can be done by a great deal less fuel than formerly was the case. During the last ten to fifteen years, annealing muffles have undergone great changes as compared with the older types, by reducing the fire-boxes and arranging the flues to circulate along the sides and under the bed; the combustion has been made more perfect; the heat circulating the muffle before leaving for the stack has resulted in a large amount of work being done with a corresponding reduction of fuel, by enveloping the muffle with heat. The most important thing to be considered is the temperature at which the waste gases should leave. This temperature, of course, should be in relation to the temperature at which the metal has to be annealed; for instance, assuming that we have to anneal at 1400 deg. Fah., the temperature of the gases as they leave should be somewhere near this point, if we are to get a muffle with the required temperature throughout.

*Paper read at February meeting of Birmingham, England, Section of the Institute of Metals.

†Consulting Engineer, Titley & Wall, Birmingham.

With end-fired muffles there is apparently a limit to their length to obtain this result, although the writer has designed them to 30 feet long bed, inside measurement, and this is somewhere near the limit to which it is possible to go with one fire on the end; these muffles have given excellent results both for annealing long wire bars and steel tubes, with something like 1 cwt. to 1½ cwt. of fuel to a ton of metal annealed; such a muffle is illustrated by Fig. 2. It will be seen the flame after leaving the fire-box passes underneath the bed through two flues which come in at the sides right at the extreme end, return over the metal, passing through two ports, one on either side, upwards, returning over the ribbed arch above the metal, the full length of the muffle, again passing away to the stack, thus circulating three times the length of the muffle bed. This type of muffle is well

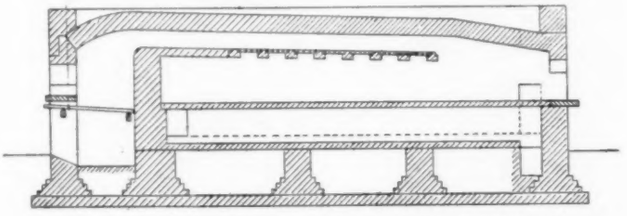


FIG. 2. END-FIRED MUFFLE WITH FLUES UNDER BED.

adapted for heavy wire bars, and is one which gives up its heat readily to the work to be done. This muffle may be described as the end-fired under type, the greatest heat first passing under the bed, and so giving a subdued or mellow heat to the bed.

The next type of end-fired muffle is illustrated in Fig. 3, and in shape has a strong resemblance to the early type No. 1, but with this difference—the fire-box is smaller, the top counter arch extends to nearly the length of the bed, but is made of a graduated strength, the arch being thickest nearest the greater heat and gradually tapering down to the tiles; the flame from the fire first passing over this arch goes through two side flues or ports in a down-

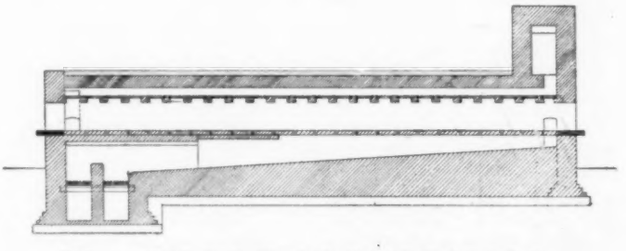


FIG. 3. WIRE BAR MUFFLE UNDER-FIRED TYPE.

ward direction on each side into separate flues back towards the fire-box, joining together in front of the bridge wall into a center flue, returning again to the charging end of the muffle, and then away to the stack. This class of muffle works very well for short or medium lengths, and probably has a limit of 20 to 22 feet in length, and will anneal fairly heavy work, and is very economical when properly handled.

Fig. 4 is a type known as the open cross-fired type, and has certain advantages over the end-fired, especially where length is concerned as practically there is no limit,

the writer having built some muffles of this type 50 feet long. They may be built wider than the usual end-fired type; the fireboxes can be made much narrower than the first mentioned class of muffle. The cross-fired muffles, as a rule, are ready for work much quicker, the flame from the fire having but a short distance comparatively to travel, the metal is nearer to the fire, and consequently gets heated sooner; a more regular heat can be maintained in a cross-fired muffle, the distance across being short in comparison.

There cannot be the same fall of temperature as in the end-fired type, and again it is not necessary to have

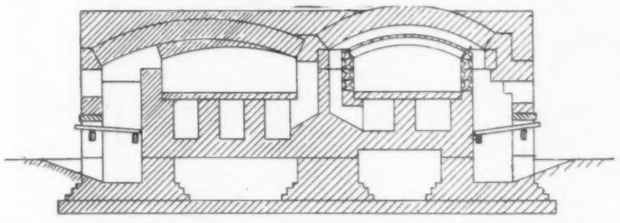


FIG. 4. CROSS-FIRED CLOSED, AND FIG. 5 OPEN ANNEALING MUFFLES.

the rate of combustion so high to reach the work. The construction of the best types of muffles of this kind are generally as follows: The flame after passing over the bridge and bed enters a series of port holes on the side opposite to the firebox; these holes should be graduated in size, the end ones being larger; the object of this being to keep each end of the muffle bed well up to its heat, as an old maxim, "keep the outer ends hot and the middle will look after itself." The waste gases after

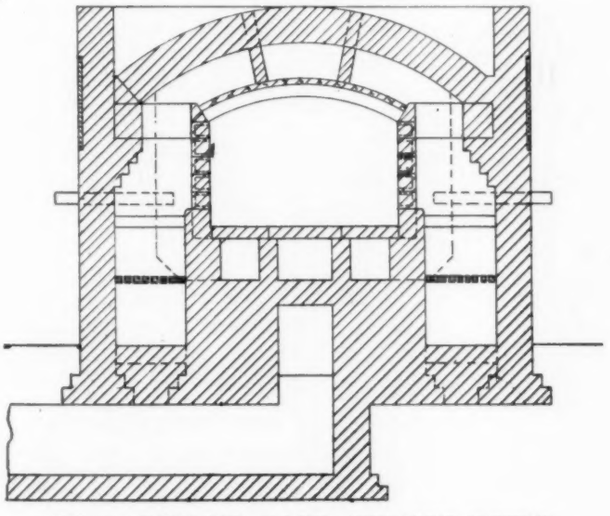


FIG. 6. SIDE-FIRED CLOSED ANNEALING MUFFLE.

passing the ports are led into a flue under the bed of the muffle and travel twice or three times, according to the width of the muffle, before finally leaving for the stack. Taken altogether this muffle is a useful and economical one, the fuel consumption being low and can be easily adapted for doing short work, which at times may come along in the course of manufacture; this may only take up half the length of the muffle, and all that is necessary is to stop firing on the other half. By this means the usefulness and utility of such a system tends to be economical.

Fig. 5 is a type of muffle used for closed annealing. It is cross-fired, and fitting over the annealing bed is an arch of rib and tiles, over which the flames pass into the ports which take a downward course into flues beneath the bed, and which are arranged in a similar manner to the open type cross-fired muffle. This class of muffle is very useful for light work, especially in the finishing stages. The action of imparting its heat to the work is by induction, and must necessarily take a little more fuel per ton of metal annealed. This muffle can be used either full length or only part of the length and the fires worked accordingly.

Fig. 6 is a side-fired muffle with a narrow firebox on each side, and as a small muffle, say not exceeding 9 ft. long by 3 ft. 6 ins. wide, is used for closed annealing metal of thin light gauges; the flame from the fires passes up the side into a flue on the top of the inner arch. In the sides of this flue are ports of graduated sizes to ensure an equal distribution of heat. The flame from this flue passes down an end flue right and left into the two outer flues underneath the bed, and are fitted with controlling bars. The flame after traveling through these outer flues returns through one center flue and then away to the stack. For small muffles this has proved to be very useful and economical, and is used for enamelling purposes and found to answer well in maintaining a regular heat of 1,800 degs. F.

Fig. 7 is a type of gas-fired closed annealing furnace.

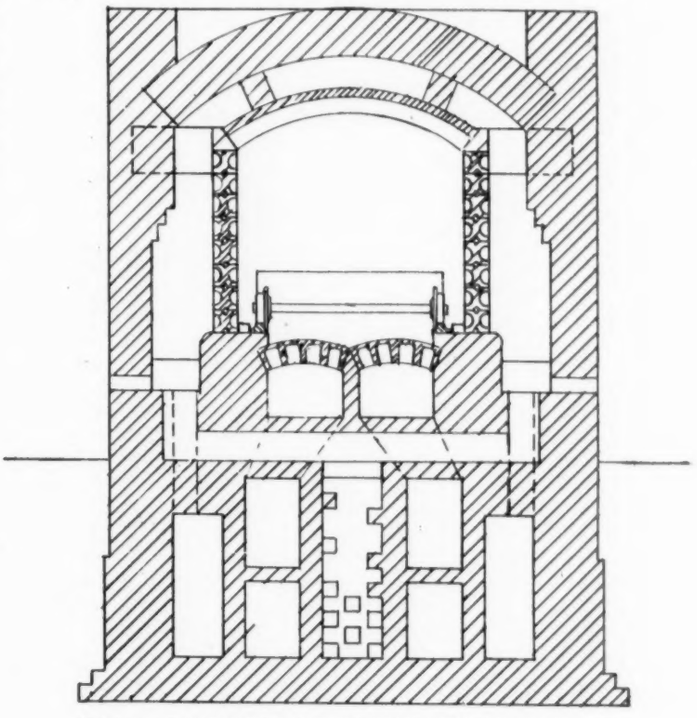


FIG. 7. GAS-FIRED CLOSED ANNEALING MUFFLE.

In such a paper as this the writer thinks a few words as to gas-firing will not be out of place. Dr. Siemens said in 1873 that he estimated that "if we could make up our minds to consume our coal in a careful and judicious manner according to our present lights, we should be able to reduce the consumption by 50 per cent. This would involve a very considerable expenditure in capital, and must be a work of time; but what I contend is that our progress in effecting economy ought to be accelerated in order to establish a balance between the present production and the ever increasing demand for heat." In fact to show the margin of improvement possible, in 1873 Dr. Siemens stated that ten million tons of coal would

give more than the equivalent of the heat energy actually required, i. e., when 105 tons were consumed; this being approximately the quantity used at that period.

From the above it will be seen what a large field is open for improved or economical appliances, amongst which the gas-producer undoubtedly holds first place, and that such economies are possible it is easy to show.

One pound of coal yielding 12,000 British thermal units represents $12{,}000 \times 772 = 9{,}264{,}000$-foot pounds or units of energy, and it is a mere matter of division to find out that it should represent 1 horse power for 4¾ hours. Out of this possible 4¾, at present the very best steam engine gives us 1 or a loss of 3¾ hours. Similarly with metallurgical furnaces, taking the specific heat of iron at 0.114 and the welding heat at 2,900 degs. F. it would require $.114 \times 2{,}900 = 331$ units to heat 1 pound of iron to that point. On the above mentioned basis of the heat value of coal, this shows that 1 ton of coal should bring 36 tons of iron to the welding heat. In coal fired re-heating furnaces, as Siemens pointed out, 1 ton of coal has been used to heat up only 1⅔ tons of iron or only 1/21 part of the theoretical maximum. This consumption has been reduced to 1.7 to 2 cwt. of coal used in the producer per ton of metal heated, which is a great improvement on coal firing, but does not reach the theoretical possible, viz.: 1 cwt. fuel to 36 cwt. of iron heated. Still it shows what gas firing is capable of doing.

The above type of annealing muffle is one the writer designed some twelve months since, and is used for annealing articles of the hollow ware kind; the temperature to be maintained is 16 to 1,800 degs. F. The muffle is 30 ft. long by 3 ft. 9 ins. wide by 3 ft. 6 ins. high, inside measurements. It is arranged with rails on the bed, as wagons are used for conveying the articles through during the time they are annealed, the length allowing for three wagons, each 8 ft. long. An average of 70 wagons are passed through every twelve hours (that is 10½ hours working time) with a fuel consumption at the producer of 25 cwt. per 12 hours. The weight of each wagon and material weighs about 3½ cwt. or 245 cwt. each turn; this equals a fuel consumption of practically 2 cwt. per ton of material heated. It being necessary that the articles should not come in contract with the flame and that the heat imparted to them is by conduction, the result is a fairly good one. The efficiency of this muffle is obtained no doubt by the material to be annealed being in close contact with the heat as generated, and to get this result gas-firing no doubt beats the coal-fired muffles; the way in which the heat is circulated around the inner chambers gives time for complete combustion; the air to assist in this is passed through checker work in the waste gas flue.

In comparing these improved methods of firing muffles, as required for the metal trades, we must take into consideration the temperature required for the work, and let me at once here state that with low temperatures, such as 12 to 1,400 degs. F., the gas-fired furnace becomes less efficient. Taking the specific heat of copper at .095 and the annealing point at 1,400 degs. F. we get the theoretical maximum that 133 units are requirel to heat 1 pound of copper to that temperature; on this basis 1 ton of coal should anneal 90 tons of copper, or 4½ tons of metal per cwt. of fuel. This is probably an ideal that may never be reached with coal fired muffles; but the subject is full of interest, especially as our fuel is limited, and it behoves manufacturers to consider this question of lessening the cost of production. I have given a general description of the muffles, with one or two exceptions, that are in general use today, and these muffles if properly designed and handled have no doubt reduced the fuel consumption 30 to 50 per cent. as to that used years ago in the older and badly designed muffles.

In arriving at the efficiency of a muffle I would like to say that a test should last at least a week or even two, and that it should be worked under the conditions to be obtained from the ordinary way in which the work has to be done in the mills; a test may be taken one day by preparing for it which may have good results, the next day may be totally different. You have to consider the working as carried out by the ordinary muffleman, who, as a rule, has no knowledge of fuel combustion; he knows nothing of the way in which to use fuel to the best advantage, and if given a muffle capable of good results, through carelessness in attention, he often wastes more fuel than is necessary to do the work. With all coal-fired furnaces a large percentage of the heat is lost by radiation more so than in gas-fired ones, the firebox being the greatest culprit, especially with end-fired muffles, whilst a large amount is lost from charging the fire and charging and uncharging the muffle. The atmospheric pressures vary daily, which have a more or less deterrent effect.

The variety of muffles is in design and usefulness almost infinite, to describe which are beyond the limits of this paper. I have, therefore, purposely confined myself to these muffles of which I have had the most practical experience, and which are in general use today. My object has been to show the improvements which of late years had taken place in this class of muffle, the results being no doubt due to a better proportion of fire grate surface to the size of the muffle, the shape of the muffle to suit the work, and a more complete combustion of the fuel from the circulation of the flues around and in close touch with the work to be annealed, thereby extracting from the fuel the greatest amount of heat before passing away into the chimney flue.

My own experience has been that however good a muffle may be designed, the manufacturer has often to suffer from careless manipulation, such as by firing in large and irregular quantities which checks combustion, from which large quantities of unconsumed carbon pass away, and which should give up heat to the muffle; by non-attention to keeping the fire-bars clear for the proper admission of air, and by non-attention to properly regulating the dampers during the time and according to the nature of the work to be annealed. It is necessary that mufflemen should be taught to understand the necessity of watching and carrying out these conditions, with a view to getting better work done, and here I would like to mention that I am an advocate for the use of the pyrometer. I am afraid in a great many instances too much is left to the muffleman to say when the material is properly annealed. What one operator may consider done that the next one may take out a little sooner, or probably leave it in a little longer. The use of the pyrometer obviates all this and would show how the muffle is being worked and would be a check against those troubles I have mentioned and a sound guide for each muffleman to follow. The pyrometer chart would be a record for each day's work, thereby enabling the tracing of any particular annealing.

There are numbers of patent muffles or furnaces which within the last few years are being advocated and placed to work. They all have for their object complete combustion, and in design some parts of them more or less follow very closely the description of those I have endeavored to show you in this paper. If we take the theoretic value of the fuel and compare what today is being obtained there is still plenty of room for improve-

ment, as I believe 1 cwt. to 1½ cwt. of fuel per ton of metal annealed is the best result by test obtainable up till now, which in the case of annealing copper is only 14 per cent. of the heat available to do the work.

The question of combustion and its most useful effect in a muffle is one of deep study, and is one that every manufacturer should consider. The saving of fuel is an important item in the cost of manufacture in the metal trades, especially as competition becomes keener and fuel dearer, and it is to those men who make a special effort in this direction that better results in the heat treatment of metal in the future may be looked for than have been proved in the past; the better this treatment of the metal the better will be the finished aricle.

"THE THREE WIRE SYSTEM" FOR A PLATING ROOM

THIS FORM OF INSTALLATION HAS BEEN TRIED OUT IN A LARGE NUMBER OF PLATING ROOMS AND HAS GIVEN UNIVERSAL SATISFACTION.

BY C. G. BACKUS.*

The plan given here shows a multipolar generator with double commutators and three terminal lugs instead of two, connected to three main conductors, which in turn are connected to six plating tanks and an electric cleaner. Each plating tank has a tank rheostat connected between the main conductor and the tank, in the negative line, and between this rheostat and the tank, a wire is attached which leads to a voltmeter switch, to enable the operator to determine the voltage at each tank by using *one* voltmeter. There are two ammeters shown with their shunts, one in the negative line, and one in the positive line. This arrangement permits the quantity of current used in each tank to be determined.

The first three tanks have a permanent connection to the negative or work line, and for the positive connection a single-pole double-throw knife switch is used, to enable the operator to throw the switch to its lower position, and use a low voltage current in each tank, or, throw the switch to its upper position and use the high voltage circuit.

You will notice that the three last tanks are connected in a slightly different manner from the first three tanks. They have a permanent connection to the positive conductor, and, in the negative line is placed a double-throw switch to give the high or low voltage current, as desired. If all six tanks were connected up the same as tanks 1, 2 and 3, they would all receive their low voltage current from the right hand end of the machine.

In order to balance the low voltage load, so that one end of the dynamo has about the same load as the other end, it is necessary to arrange the connections so that part of the tanks receive their low voltage from a connection made between the negative and the neutral line, and the balance receive their low voltage current by a connection between the positive and neutral lines.

In further explanation of this form of dynamo and its connections, each end of the armature of the generator has the wire so arranged that a separate and distinct current is generated at each end. In a two-wire system the negative of one end is joined to the negative of the other end, and the two positive lines are joined together. But in the three-wire system the negative line from one end is

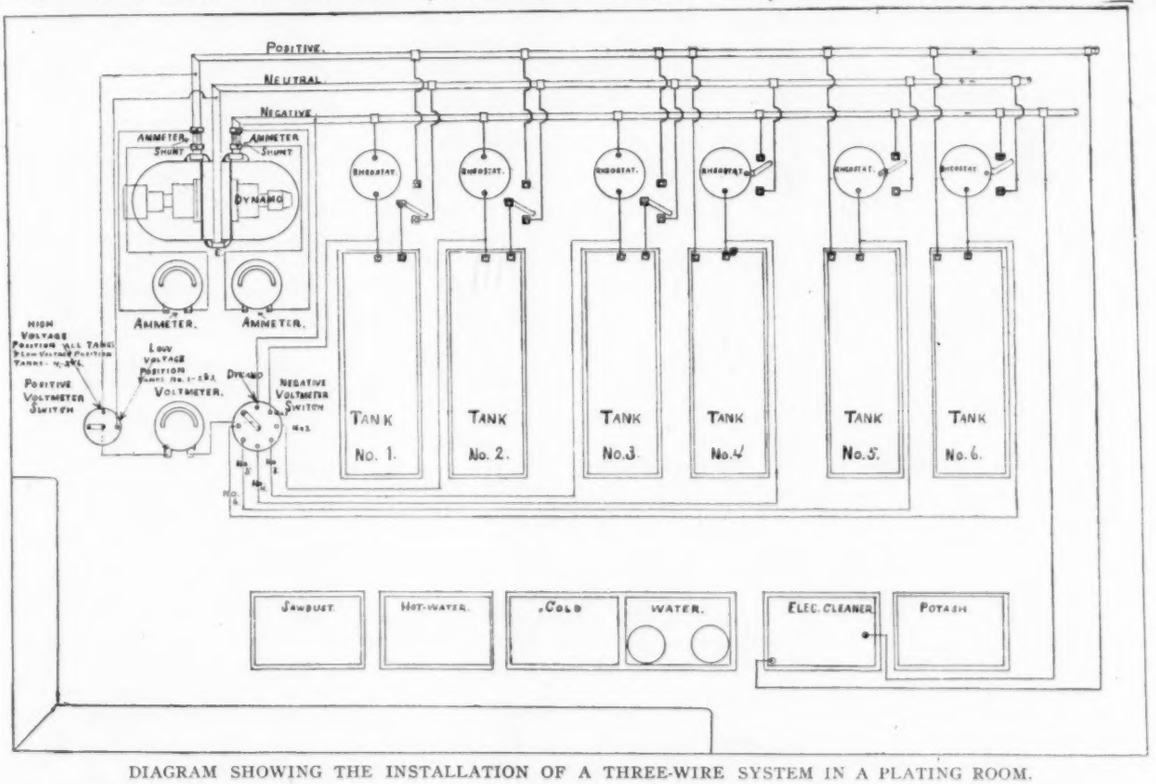


DIAGRAM SHOWING THE INSTALLATION OF A THREE-WIRE SYSTEM IN A PLATING ROOM.

*Backus & Leeser, New York.

joined to the positive of the other end, and from this point of union a line is run called the neutral line. So called because you can make a connection between this line and the positive line at one end of the machine, or a connection can be made between this neutral line and the negative line leading from the other end of the dynamo.

As an illustration, suppose the generator shown in this drawing is one of a rated capacity of 2,000 amperes, 6 volts. Each end of the armature would generate a current of 6 volts and 1,000 amperes, or connected up for the two-wire system 2,000 amperes and 6 volts. Now, if connected up for the three-wire system you can obtain, by using the neutral wire connection, two circuits, each of 6 volts 1,000 amperes; or by ignoring the neutral wire and using the other two terminals only, you can obtain 12 volts and 1,000 amperes.

Referring to the drawing, tanks Nos. 1, 2 and 3 are connected up in the same manner, and when the double-throw switches are in their lower position, these tanks receive their low voltage current from the right hand end of the dynamo. When the switches are in the upper position the tanks receive the current generated at *both* ends of the armature, which will be just double the voltage they receive in the previously described way.

Tanks Nos. 4, 5 and 6 receive their low voltage currents from the left hand end of the dynamo when their double-throw switches are in the lower position, and when these switches are thrown to their upper position they receive double this voltage, by a connection which receives its current from both ends of the dynamo.

To obtain an absolutely correct reading of the voltage used in each tank, it is desirable to attach the two wires leading to the voltmeter as close to the tank as possible. You will notice in the drawing I have shown all voltmeter wires attached to the negative conductor, between the rheostat and the tank, while the positive connection to the voltmeter is attached to the main conductors. This connection to the main conductors is permissible only, when all conductors are of ample size and is shown here in this manner to simplify the drawing.

In the three-wire system there are only two ways of connection for the positive lines, and in actual practice it would be better to use insulated wire for all connections to voltmeter lines, and bring the collected wires in cable form to the two terminals in the positive voltmeter switch.

To determine the voltage in any tank, such as tank No. 6, turn the handle of the negative voltmeter switch to No. 6, and turn the handle of the positive voltmeter switch to the position at the top of the switch. To determine the number of amperes being used in any tank turn the handle of the rheostat of that tank so that the circuit is broken, and note the drop in amperes on the ammeter, or, if the circuit is broken at the rheostat turn the handle of the rheostat to the position desired, and note the change shown on the ammeter. In this drawing we have placed the ammeters near the dynamo, and the voltmeter and the switches near the middle of the drawing simply for convenience in illustrating. Their probable position in actual use would be on the wall.

CRUCIBLE AND FURNACE RELATIONSHIP

By Jonathan Bartley.*

How much does the life of a crucible depend on the furnace it is used in, both in reference to size and shape? In other words, will a crucible last longer; give a greater number of heats if used in a furnace that is built to conform to its particular size rather than if used in one better adapted for a larger or smaller size? This is probably a question little considered in the average foundry. As a rule the foundryman in building his furnace will make it "large enough" to accommodate a size or so in excess of what he expects to begin with. This to our mind is a mistake based on the following reasons from practical experience.

Several years ago, when the writer was superintendent for a large crucible plant, he was furnishing a large rolling mill with crucibles. They bought in carload lots and used two sizes, No. 70 and No. 50. The reports always showed that the No. 70 ran a greater number of heats than the No. 50. Reports from our "book of experience" lie before us and show that in January, 1900 our No. 70 gave a record of 33 heats, while the No. 50 fell down at 24 heats. Our customer stated that he was using them on precisely the same metal with the same fuel. We were nonplused because the same formula was used in both sizes, in fact they came from the same batch or mixing. Every car we shipped them gave the same result until in 1903 they abandoned the use of our No 50, but continued to use our No. 70. In March, 1903, we had a report that our No. 70 gave the usual average of 33 heats, while a competitor's No. 50 gave 30 heats. We visited this plant and found twenty-four round pit furnaces all built alike in size and shape. We noticed that they used the No. 50 in the same furnace as the No. 70. We also noticed that our competitor's No. 50 was fully as large as our No. 60. This began a line of reasoning.

In our city was a neighboring foundry that always accommodated us with our experiments. If we wanted a new formula tried out, they always did it for us. Fortunately they, too, used a No. 70 and the average on their class of work was about 40 heats. We sent them six No. 50 crucibles to be used in this furnace and they reported 34 heats. We next sent them six No. 80's and these ran 44 heats on the same metal with coke for fuel. Our next try was a No. 100 and then the record dropped to 30. We watched this experiment very closely, jotting down every detail. The No. 50 seemed to oxidize, and while the walls remained thick, the life gradually leaked away, showing a good appearing crucible on its thirty-fourth run, when they all began to leak just below the bilge. Breaking them, they presented a dull dead color with practically no evidence of graphite. The No. 80's all wore down thin and when broken, showed their original luster of graphite in the walls. The No. 100's all cracked, due we thought to too little space between the crucible and furnace wall, necessitating too hard ramming of the coke. Another noticeable fact is that a square furnace will not give as great a number of heats to the crucible as a round one.

We have talked with a great many foundrymen on this subject, and most of them had never given it a thought, and had always believed that as long as a furnace was large enough to accept a crucible it made no difference how much too big it was, however, all seemed to agree that it was reasonable that there should be a proper relation between the furnace and crucible to obtain the best

*President, Bay State Crucible Company, Taunton, Mass.

results. Crucible makers do not have a standard size and this may explain why it is at times one will come "heads up" in one plant and "tails up" in another. While the above is from experience with pit furnaces with coke or coal for fuel, the same thing applies to an oil or gas furnace.

A letter is before us now from a large manufacturer of oil furnaces, and he states as his experience that crucibles larger or smaller than a size designed for his furnace did not give good service on account of an increase or decrease of the combustion chamber. Frequent calls are made for a No. 150 crucible to go in a No. 125 furnace and almost invariably the crucible manufacturer is told his No. 150 was not the same quality with the No. 125. Foundrymen have different views as to the proper fuel space required. Before writing on this matter we interviewed several good practice men, and they all seemed to differ in opinion. One considered a 3-inch space around a No. 60 crucible sufficient, another thought at least 6 inches should be allowed and so on. We are frank to confess that we don't know what the proper relation should be, but the furnace in which our experiment was made was 20 inches in diameter, thus giving about 4 inches of fuel space on a No. 70 crucible.

THE INFLUENCE OF POURING TEMPERATURE ON ALUMINUM ALLOYS *

By H. W. Gillett.†

The tensile strength of the light casting alloys of aluminum is greatly influenced by the size of the constituent crystals, or as the foundryman puts it, the "closeness of the grain." For any given composition, the finer the grain that can be produced, the stronger the metal.

These alloys follow the general rule that slow crystallization produced large crystals and rapid crystallization small ones. The speed of freezing is influenced by (a) the volume of metal in the casting and its relative dimensions, small thin castings freezing quickly and large, thick ones, slowly, (b) the temperature and heat conductivity of the mold (c) the temperature at which the metal is poured into the mold.

In practice (a) is fixed by the pattern from which the casting is to be made, and (b) is practically fixed by the ordinary use of green sand molds and dry sand cores, and is only altered by the use of "chills"—(pieces of metal placed in the mold at points where slow freezing would cause cracks or shrinks, and where the extra strength due to rapid freezing is essential to securing a good casting). The effect of these chills is mainly local as they are not used in sufficient quantity to greatly alter the speed of freezing of the whole casting. Hence the only variable is the temperature of pouring.

In making either commercial tests or scientific investigations of any physical property of cast aluminum alloys, the size of test piece, the composition of the mold and the pouring temperature should be recorded.

Table I shows the effect of the size of the bar—the alloy used being 8 per cent. Cu 92 per cent. Al.—poured at 1,300 degs. F. in green sand.

TABLE I.

Dimensions	Area of Cross Section sq. in.	Tensile Strength lbs. per sq. in.
Flat 0.9 in. x 0.4 in	0.36	16,000
" 0.75 in. x 0.25 in	0.19	18,000
Round 0.40 in. diam	0.126	20,000
" 0.45 in. "	0.159	19,000
" 0.50 in. "	0.196	18,000
" 0.75 in. "	0.442	16,000
" 1.00 in. "	0.785	13,500

Henry Souther gives the following for an alloy of 16 per cent. Zn 2½ per cent. Cu 81½ per cent. Al.—all the bars being poured in the same mold.

There is evident necessity for a standard test bar. The best size is that specified by the Society of Automobile Engineers (Transactions Vol. 6, p. 520). This is ½ inch diameter at the breaking section, which is 2 inches long and filleted for at least ⅜ inches to a ¾-inch diameter threaded end. The use of chills or artificial methods of cooling is prohibited. The bar is to be tested unmachined in the breaking section, but with threaded grips. The American Society for Testing Materials specifies a similar bar but machined.

Machining bars and threading grips is expensive and impractical where large numbers of routine tests are made. It is also unnecessary as the errors of measurement need not be great on a properly molded unmachined bar. We have tested thousands of bars on which the variation from the mean diameter of a ½-inch bar was not over 5-1000 inches and in many cases it is less than 2-1000 inches.

TABLE II.

Dimensions	Tensile Strength
Flat 1 in. x ⅛ in	27,000
1 in. x ¼ in	25,700
1 in. x ⅜ in	22,200
1 in. x ½ in	22,800
1 in. x ⅝ in	22,400
1 in. x ¾ in	21,200
1 in. x ⅞ in	21,700
1 in. x 1 in	18,800

We took 150 bars consisting of 75 pairs of bars cast in the same mold, the alloy being No. 12, and the pouring temperature 1,300 degs. F. Three sets of 25 companion bars were tested without machining or threading grips, one set was machined just far enough to clean up and the grips threaded, one set had threaded grips but was not machined in the breaking section, the other set was machined in the breaking section but the grips were not machined or threaded. The results follow:

TABLE III.

Set Number	Bars not machined or threaded	Companion bars	
1	17,830	18,450	machined and threaded
2	18,020	18,460	threaded but not machined
3	17,970	18,790	machined but not threaded

It is plain that improvement due to more accurate measurement of the machined section, or to a straighter pull on the testing machine due to the use of threaded grips and ball and socket holders, is not enough to pay for the machining, therefore the tests that follow, are on bars as cast, and pulled in wedge grips.

The quantitative effect of pouring temperatures is shown by Table IV, for an alloy of 8 Cu 92 Al., the standard Society of Auto Engine Test bar, six in a mold, molded in green sand with gates the full size of the end of the bar, poured from a 1-inch sprew at one end with a 1-inch riser at the other.

Table V gives the averages for some fifty alloys poured cold and hot. The percentage of alloying ele-

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†Research Dept., Aluminum Castings Co., Detroit, Mich.

ments is given in the column headed "Composition," the balance being aluminum containing 0.3 per cent. Fe and 0.2 per cent. Si as impurities.

TABLE IV.

Pouring temp. deg. "F"	Tensile Strength lbs. per sq. in.
1,200	20,000
1,250	19,500
1,300	19,200
1,350	18,500
1,400	18,000
1,450	17,800
1,500	17,500
1,550	17,000
1,600	16,000

TABLE V.

		Poured Cold		Poured Hot	
No.	Composition.	Prg. Temp. deg. F.	Tensile strength lbs. per sq. in.	Prg. Tem.	Ten. Str.
1	Pure Al.	1,400	10,500	1,600	8,000
2	2 Cu	1,225	13,800	1,600	11,500
3	4 "	1,225	15,500	1,600	13,000
4	6 "	1,225	17,600	1,600	14,500
5	8 "	1,225	20,000	1,600	15,500
6	10 "	1,225	21,000	1,600	16,000
7	12 "	1,225	22,500	1,600	17,500
8	4 Zn	1,225	13,000	1,550	10,000
9	8 "	1,225	17,000	1,550	12,700
10	12 "	1,225	21,000	1,550	14,000
11	16 "	1,225	24,000	1,550	17,000
12	20 "	1,225	27,000	1,550	20,000
13	24 "	1,225	30,000	1,550	24,500
14	28 "	1,225	33,000	1,550	27,500
15	32 "	1,225	35,000	1,550	30,000
16	36 "	1,225	37,000	1,550	33,000
17	3 Cu 3 Zn	1,225	17,000	1,550	13,000
18	7½ Cu 1 Zn	1,225	18,000	1,550	14,000
19	8 Cu ¼ Zn	1,225	20,000	1,550	17,000
20	8 " ¼ "	1,225	20,500	1,550	17,000
21	3 " 6 "	1,225	19,000	1,550	13,500
22	7 " 3 "	1,225	19,500	1,550	15,500
23	6 " 5 "	1,225	20,000	1,550	15,000
24	2 " 10 "	1,225	23,000	1,550	15,500
25	4 " 8 "	1,225	23,500	1,550	17,000
26	5 " 10 "	1,225	24,000	1,550	18,500
27	7 " 9 "	1,225	25,000	1,550	18,000
28	3 " 12 "	1,225	26,000	1,550	18,500
29	3 " 15 "	1,225	28,500	1,550	19,500
30	3 Cu 15 Zn ½ Mn	1,225	30,000	1,550	20,000
31	2½ Cu 19 Zn	1,225	33,000	1,550	25,000
32	4 Cu 15 Zn	1,225	32,000	1,550	23,000
33	2 " 22 "	1,225	36,000	1,550	28,000
34	2 " 25 "	1,225	37,000	1,550	33,000
35	1¼ Cu 30 Zn	1,225	42,000	1,550	34,000
36	3 Cu 25 Zn	1,225	37,500	1,550	29,500
37	2 Mn	1,200	19,000	1,550	18,500
38	8 Cu ¼ Mn	1,200	20,000	1,500	17,500
39	7 " ½ "	1,200	19,000	1,500	16,000
40	6 " ½ "	1,250	18,500	1,500	16,500
41	4 " 1 "	1,250	16,000	1,500	15,000
42	8 Cu 2 Sn	1,215	18,000	1,475	15,750
43	5 " 3 "	1,215	16,800	1,500	15,000
44	6 Cu 1 Ni	1,300	18,200	1,600	14,500
45	8 Cu ¼ Ti	1,250	19,000	1,500	18,400
46	8 Cu ¼ Cr	1,200	19,500	1,500	15,900
47	8 Cu ¼ Sb	1,250	20,000	1,500	17,400
48	8 Cu ¼ Vd	1,250	20,000	1,500	18,500
49	8 Cu ¼ Cd	1,250	18,600	1,500	15,800
50	8 Cu ¼ Bi	1,250	18,000	1,500	14,000
51	4 Cu 4 Ag	1,300	19,700	1,550	15,400
52	8 Cu 1½ Fe ¾ Si	1,250	21,000	1,500	18,000
53	5 Mg	1,250	20,500	1,400	20,000

It will be noted that the bars poured hot average nearly 20 per cent. weaker than those poured cold. The notable exceptions are the alloys with 2 per cent. Mn and with 5 per cent. Mg. The first has such a low elastic limit that it is seldom available for commercial use in castings. The alloys with magnesium oxidize so readily at high temperatures that it is essential to keep the temperature to which the metal is heated and at which it is poured as low as possible to prevent burning out the magnesium and also to prevent getting a casting weak through the presence of dross caught in the metal.

The fifth alloy in the table, that with 8 per cent. Cu is the one most used for casting, easily 90 per cent. of all cast aluminum, being of this alloy. The 11th, 15th, 30th, 31st, 35th, 43rd, 44th, and 53rd, also find some commercial use, but a discussion of their relative values is outside the scope of this paper.

The addition of small amounts of Mn, Ti, Fe, Sn, or Sb to the 8 per cent. Cu alloy increases the strength when poured hot, while Ni, Cr, Cd, or Bi seem to be without much influence. Unfortunately, as far as our tests have gone, the elements which give increased tensile strength on hot pouring tend to cause brittleness and decrease the resistance to impact. The discussion of these points also lead us too far afield.

The most progressive foundries are now pouring all aluminum castings under strict pyrometric control, the temperature chosen for each particular casting being the lowest at which the mold will fill and at which the metal will still not freeze quickly to give up air trapped in pouring, which causes blow holes.

Many published investigations on aluminum alloys have given results far below the real value for tensile strength on account of hot pouring, or else due to irregularities in pouring temperatures, the results are ragged.

Souther's results, quoted in Table II, the work of Lane on magnesium as a deoxidizer in aluminum (Castings, February, 1911, page 164). Portevin's work on Aluminum Zinc (Revue de Métallurgie, September, 1911, page 271), Simpson's work on the same (See Ewen & Turner) Journ. Inst. Metals IV, page 151) all run low at least in spots from this cause.

The figures given for Al Zn cast in a graphite mold by Bancroft (The Foundry, February, 1910, page 268) are about the same as we get for green sand. Bancroft's pouring temperatures were controlled, and were as low as practical. His bars however, were larger than ours and the extra bulk of metal compensated for the chilling by the graphite mold.

Curry & Woods (Journ. Phys. Chem. Vol. XI, p. 461) get higher results on Al Cu than are obtained under the conditions of our tests, in green sand with a ½-inch diameter bar, as they used a graphite mold and a bar of half the cross-section of ours. They too, poured cold.

In the classical work of Carpenter & Edwards on the alloys of Aluminum & Copper (8th Rept. Alloys Res-Comm., Inst. of Mech. Eng.) they recognize (Collected Researches—Nat'l. Phys. Lab. Vol. III, p. 125) the influence of pouring temperatures, and say they pour as cold as possible, but their low results (p. 212) for alloys above 4 per cent. copper show that their method of judging temperatures by the eye was not adequate. They drew the erroneous conclusion that the tensile strength did not increase with increasing copper above 4 per cent., and the error was doubtless due to disregard of pouring temperatures.

Rosenhain and Lantsberry (Coll. Res.-Nat'l. Phys. Lab. Vol. VII) in their work on Al-Cu-Mn, cast their bars at a moderate temperature (p. 156), but really determined the pouring temperature on only one alloy

(p. 162) finding hot pouring to be detrimental on that.

Where any of these workers have taken the pouring temperatures, they have used platinum thermocouples in protecting tubes. The lag with this method is considerable, and we have found that base metal couples or "fire rods" of the welded end, rod, and tube type essential for quick readings. Some makes of pyrometer couples are too readily corroded by the aluminum, but we find the "Advance" fire rod—a cheap base metal couple—to stand up against this corrosion remarkably well.

We use the Fahrenheit scale simply because twenty-five degrees too high a pouring temperature would mean about the same to the average workman in any scale, and by using the Centigrade scale it would be more difficult to get him to pour so near the temperature he was told to use, as with the Fahrenheit.

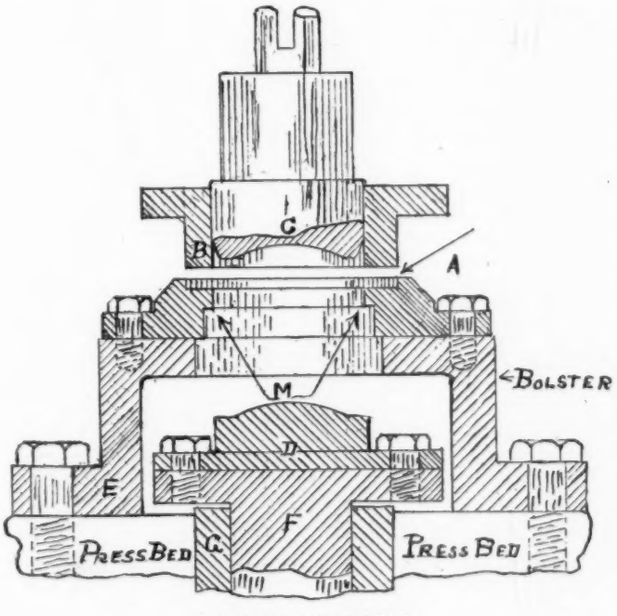
COMBINATION DIES

THE SIXTH OF A SERIES OF ARTICLES ON THE MANUFACTURE OF DIES. CONTINUED FROM FEBRUARY.

BY EASY WAY.

DOUBLE ACTION DIES.

Double action dies do the same work as combination dies, but in a greater variety and require a press constructed with a toggle joint to perform their functions. These presses are made to operate single or multiple gangs of double action dies, and there are presses that will produce from one to fourteen cut and drawn cups at each stroke of the press, at the rate of seventy strokes a minute, or nearly 1,000 cups per minute. This is accomplished by an automatic feed that supplies the stock to the dies. To describe the requirements for producing a double action die, the same condition must govern as with a combination die. That is to say, one must know the material to be used, also the size and the thickness, because this determines whether one or several operations are required to obtain the required results. Also whether a push through or solid bottom die is required to produce the best work. With a push through double action type the



A TRIPLE ACTION DIE.

lower die is fastened direct to the press bed, while the combined blank holder and cutting punch is worked by the outer press slide which moves slightly in advance of the drawing punch governed by the inner press slide. The outer slide in double action presses is so designed that after making its stroke it stops during about one-quarter of the revolution of the crank shaft. The cut blank drops into the lower die and is there held with the proper tension during the down dwell of the outer press slide. The drawing punch continues to advance downward, thus drawing the blank from between the upper die and lower pressure surface, and this prevents wrinkling. This type of drawing die is suitable for plain work, but should a shape be desired, it becomes necessary to use the solid bottom type where the required shape can be worked in the draw punch, also in the bottom of the die which is known as the push-out, because it works up and down. And when in the lower position it receives the thrust that gives the shape to the article, and when in the upper position has delivered the unit from the die in its upward travel with the punch. All the other parts of this type die are the same as the push-through style.

TRIPLE ACTION DIES.

Triple action dies are a combination of the push-through type and solid bottom dies in one and are superior when impression work is required, as they eliminate the finished unit, passing up through the die for delivery when completed. Very profitable results are obtained from this type of die when used on an incline press. The sketch shown will convince of their superior qualities when compared with the push-through and solid-bottom type. However, this class of die does cut, draw and stamp in one operation the same as the solid bottom die, but delivers the finished unit at the bottom of the drawing die the same as the push-through die type and eliminates the passing of the article through the die again, allowing the operator of an automatic feed to work continuously when used on an "incline press." Reference to the sketch will explain the construction, and these differences will be noted in comparison with the push-through and solid bottom type. This class of die has a raised bolster E which the die A is located on. B is the blank holder and cutting punch. C the drawing and forming punch, and D the forming die which corresponds to the solid bottom die type. After the unit is cut and drawn by A, B and C the forming punch C continues downward and controls the unit until its outer surface engages with the forming die D, located on plunger F contained in the sleeve G, on its upward stroke where the unit receives the desired form of impression. Then on the upward travel of the punch the finished unit is stripped at M, comparatively the same as with the push-through die type, and from here is delivered by gravity to the receiving receptacle finished. This class of die will furnish drawn work with any design of impression required at the same rate of speed as plain work is produced from a push-through double action die, and eliminate the double handling of the work, also the services of another press and its attendant.

(To be continued.)

THE ELECTRODEPOSITION OF BRASS AND BRONZE*

By C. W. Bennett.†

The solutions used for the deposition of these alloys are those in which the concentration of copper as ion is low. They are, therefore, solutions of complex salts. The difficulty experienced in the deposition of brass is not so great as that encountered with bronze. In the former case it is only necessary to obtain a solution in which the voltages required to deposit the two metals are as close together as possible. Having obtained this, the current density and relative concentration of the metals in the solution may be varied until the deposit contains both metals in the desired proportions. In the the case of bronze, however, another condition is introduced which is practically very hard to regulate. Substitution of tin for zinc introduces the possibility of the oxidation of tin and also of its dissolving and forming a colloid. In this case there is a possibility of depositing metals existing in the solution in the following forms: Cupric, cuprous, stannous and stannic ions and as colloidal oxide. Some of the bronzing solutions give lovely deposits for a short time. After running for a while the deposit becomes rich in either copper or tin. This is due to the fact that some of the changes mentioned above have altered the solution so that the original conditions no longer obtain. The most important changes, it is believed, are the oxidation of the tin over to the stannic condition, and the formation of the colloidal oxide. A plating can be obtained, therefore, if a large volume of the solution be used or if a new solution be continuously run in. No solution, however, gives satisfactory plate continuously. As may be expected, therefore, while brass is plated commercially, no satisfactory solution has ever been suggested for bronze. The solutions recommended for these depositions are given below.

PART I. BRASS.

Heeren's[1] solution is the following:

Copper sulphate	3	grams
Zinc sulphate	26	"
Potassium cyanide	60	"
Water	1	liter

Roseleur recommends three solutions.[2] The first is:

Copper carbonate (freshly precipitated)	12.0	grams
Zinc carbonate (freshly precipitated)	7.0	"
Potassium cyanide	20.0	"
Sodium carbonate	20.0	"
Sodium bisulphite	20.0	"
Arsenious acid	0.2	"
Water	1	liter

For all metals this bath is recommended:

Copper acetate	12.5	grams
Zinc chloride	12.5	"
Sodium carbonate	30.0	"
Sodium bisulphite	20.0	"
Potassium cyanide	35.0	"
Arsenious acid	0.2	"
Water	1	liter

It is stated that these solutions should be boiled before being used. Working for several hours is said to make them work better. The amount of sodium carbonate may be increased to about 90 grams per liter if iron is to be plated.

Lastly, the following is recommended for coating zinc:

Copper acetate	14	grams
Zinc chloride	14	"
Sodium bisulphite	28	"
Potassium cyanide	30	"
Ammonia (sp. gr. 0.9)	16	"
Water	1	liter

Cuproso-cupric sulphite or cuprous oxide may be used in the preparation of the brassing solution. A solution from cuprous oxide will be given:[3]

Cuprous oxide	8.5	grams
Zinc chloride	8.0	"
Potassium cyanide	30.0	"
Sodium bisulphite	20.0	"
Water	1	liter

Copper and zinc cyanides or potassium cupro- and potassium zinc cyanides may also be used, the final solution being practically the same as those given above.

Gore[4] recommends this solution for iron:

Copper acetate	12.5	grams
Zinc chloride	10.0	"
Potassium cyanide	38.0	"
Sodium carbonate	100.0	"
Sodium bisulphite	20.0	"
Water	1	liter

Morris and Johnson[5] recommend the following:

Copper cyanide	12.5	grams
Zinc cyanide	6.2	"
Potassium cyanide	100.0	"
Ammonium carbonate	100.0	"
Water	1	liter

The concentration of cyanide is so high here that it is doubtful whether deposition will occur, except at a high temperature or with a high current density.

Pfanhauser[6] recommends the following for coating upon all metals:

Copper cyanide	42	grams
Zinc cyanide	42	"
Potassium cyanide	4	"
Ammonium chloride	4	"
Ammonia-soda	20	"
Water	1	liter

Another solution[7] is the following:

Copper chloride	5.0	grams
Zinc sulphate	10.0	"
Potassium cyanide	2.4	"
Potassium carbonate	120.0	"
Ammonium nitrate	61.0	"
Water	1	liter

Several other solutions differing slightly from the above[8] may be given:

Copper chloride	7.5	grams
Zinc sulphate	15.0	"
Potassium carbonate	180.0	"
Ammonium nitrate	90.0	"
Water	1	liter

Another solution is:

Copper chloride	5.5	grams
Zinc sulphate	8.0	"
Potassium carbonate	65.0	"
Potassium cyanide	10.0	"
Water	1	liter

*A paper presented at the twenty-third general meeting of the American Electrochemical Society, at Atlantic City, N. J., April 3-5, 1913.

†Electrochemical Laboratory, Cornell University.

[1]The references given simply to name and page refer to the books of these authors. Watt and Philip: p. 381; McMillan: p. 283.

[2]Langbein: p. 324; Brannt: p. 239; McMillan: p. 283; Watt and Philip: p. 381.

[3]Langbein: p. 326.

[4]Langbein: p. 328; Brannt: p. 242.

[5]Brannt: p. 242; McMillan: p. 283; Watt and Philip: p. 380.

[6]Brannt: l. c., p. 243.

[7]Fontaine: p. 145; McMillan: p. 283; Watt and Philip: p. 378.

[8]Fontaine: p. 146; McMillan: p. 283; Watt and Philip: p. —.

Russell and Woolrich's solution contains the following:

Copper acetate	150 grams
Zinc acetate	15 "
Potassium acetate	150 "
Potassium cyanide	to dissolve precipitate first formed
Water	1 liter

Walenn recommends the following:

Copper nitrate, Zinc sulphate	Saturated solution
Ammonium hydroxide	Sufficient to redissolve hydroxides
Potassium cyanide	In excess

Salzède's solution is the following:

Copper chloride	3 grams
Zinc sulphate	7 "
Potassium cyanide	10 "
Potassium carbonate	100 "
Water	1 liter

Watt's solution is:

Copper acetate	4.5 grams
Zinc sulphate	9.0 "
Potassium cyanide	7.5 "
Potassium hydroxide	67.0 "
Ammonium hydroxide	30.0 "
Water	1 liter

A patented[9] solution contains:

Copper carbonate (freshly precipitate)	35 grams
Zinc oxide	23 "
Potassium cyanide	165 "
Potassium carbonate	75 "
Water	1 liter

The addition of cupric ammonide ($Cu_2O.4NH_3$)[10] is said to aid the deposition of a good brass plate.

[9]U. S. Pat., 34,640.
[10]Phil. Mag. [4], 1, 43, (1871).

Some commercial brass plating solutions may be given:

Copper carbonate (dry)	50 grams
Zinc sulphate	30 "
Potassium cyanide	75 "
Water	1 liter

Copper anodes are used and zinc salt added from time to time.

Another solution used is the following:

Copper carbonate	50.0 grams
Zinc carbonate	10.0 "
Potassium cyanide	110.0 "
Sodium carbonate	14.0 "
Sodium bisulphite	3.5 "
Ammonium hydroxide	7.0 "
Water	1 liter

These solutions are all made up to give a brass containing 30 to 40 per cent. zinc. Consequently anodes of this composition are used.

A solution used in the laboratory at Cornell contains:

Copper sulphate	25 grams
Zinc sulphate	29 "
Potassium cyanide	to dissolve the precipitate
Water	1 liter

TABLE I.

Solutions for the Deposition of Brass.

Parts by weight of ingredients to 1000 parts of water.

	Copper Sulphate	Copper Carbonate	Copper Acetate	Copper Cyanide	Cuprous Oxide	Copper Chloride	Copper Nitrate	Zinc Sulphate	Zinc Carbonate	Zinc Chloride	Zinc Cyanide	Zinc Acetate	Zinc Oxide	Potassium Cyanide	Sodium Carbonate	Sodium Bisulphite	Arsenious Acid	Ammonium Hydroxide	Ammonium Carbonate	Ammonium Chloride	Ammonia-Soda	Ammonium Nitrate	Potassium Carbonate	Potassium Acetate	Potassium Hydroxide	Sal-Soda	Water
1	3	..	...	..	..	..	..	26	..	..	..	..	..	60	...	..	...	...	...	..	..	..	...	...	..	..	1000
2	...	12	...	..	..	..	..	..	7	..	..	..	..	20	20	20	0.2	...	...	..	..	..	...	...	..	..	1000
3	...	..	13	..	..	..	..	..	..	13	..	..	..	35	30	20	0.2	...	...	..	..	..	...	...	..	..	1000
4	...	..	14	..	..	..	..	..	..	14	..	..	..	30	...	28	...	16	...	..	..	..	...	...	..	..	1000
5	...	..	...	..	9	..	..	..	..	8	..	..	..	30	...	20	...	...	...	..	..	..	...	...	..	..	1000
6	...	..	13	..	..	..	..	..	..	10	..	..	..	38	100	20	...	...	...	..	..	..	...	...	..	..	1000
7	...	..	...	13	..	..	..	..	..	..	7	..	..	100	...	..	...	...	100	..	..	..	...	...	..	..	1000
8	...	..	...	42	..	..	..	..	..	..	42	..	..	4	...	..	...	...	...	4	20	..	...	...	..	..	1000
9	...	..	...	..	..	5	..	10	..	..	..	..	..	2.4	...	..	...	...	...	..	..	61	120	...	..	..	1000
10	...	..	...	..	..	8	..	15	..	..	..	..	..	...	...	..	...	...	...	..	..	90	180	...	..	..	1000
11	...	..	...	..	..	6	..	8	..	..	..	..	..	10	...	..	...	...	...	..	..	..	65	...	..	..	1000
12	...	..	150	..	..	..	..	..	..	..	..	15	..	q. s.	...	..	...	...	...	..	..	..	...	150	..	..	1000
13	...	..	...	..	..	..	s.	s.	..	..	..	..	..	ex	...	..	...	q. s.	...	..	..	..	...	...	..	..	1000
14	...	..	...	..	..	3	..	7	..	..	..	..	..	10	...	..	...	...	...	..	..	..	100	...	..	..	1000
15	...	..	4.5	..	..	..	..	9	..	..	..	..	..	7.5	...	..	...	30	...	..	..	..	...	...	67	..	1000
16	...	35	...	..	..	..	..	..	..	..	..	..	23	165	...	..	...	...	...	..	..	..	75	...	..	..	1000
17	...	50	...	..	..	..	..	30	..	..	..	..	..	75	...	..	...	...	...	..	..	..	...	...	..	..	1000
18	...	50	...	..	..	..	..	..	10	..	..	..	..	110	14	4	...	7	...	..	..	..	...	...	..	..	1000
19	112	..	...	..	..	..	..	37	..	..	..	..	..	147	...	..	...	...	...	..	..	..	6	...	5	94	1000
20	25	..	...	..	..	..	..	29	..	..	..	..	..	q. s.	...	..	...	...	...	..	..	..	...	...	..	..	1000

Another combination[11] highly recommended is the following:

Solution 1:

Copper sulphate	112 grams
Potassium cyanide	112 "
Sal soda	69 "
Potassium hydroxide	5 "
Water	⅔ liter

Solution 2:

Zinc sulphate	37 grams

[11]National Electroplaters' Assoc., March 29, 1912.

Potassium cyanide	35 grams
Sal soda	25 "
Potassium carbonate	6 "
Water	1/3 liter

The current is started on solution 1, and, while working slowly, solution 2 is added slowly until the desired brass is obtained.

A patented solution[12] contains:

Copper carbonate	37.5 grams
Tin oxide	7.5 "
Potassium carbonate	15.0 "
Potassium cyanide	202.5 "
Water	1 liter

Failing to obtain good deposits with any of the solutions recommended by plating handbooks, Langbein recommends[13] the following:

Solution 1:

Sodium pyrophosphate	50 grams
Water	1 liter

To this solution are added the following solutions 2 and 3 in proportions depending on the composition bronze desired:

Solution 2:

Sodium pyrophosphate	Saturated solution
Copper phosphate	To saturation

Solution 3:

Sodium pyrophosphate	Saturated solution
Stannous chloride	To saturation

PART II. BRONZE.

Bronzing solutions are also numerous. The most striking fact, however, is that practically all of them are impracticable. None that has been tried personally gives a satisfactory plate. Commercially, of course, the bronze color is imitated with brass, or by coloring with some reagent.

If the deposit is too light more copper solution is added; if too dark, more tin. The anodes of cast bronze are said to dissolve readily in the solution.

[12]U. S. Pat., 34,640.
[13]Langbein: p. 337; Brannt: p. 248.

Salzède's[14] solution, to be used at 30 degs. to 35 degs. C., is:

Cuprous chloride	1.5 grams
Stannous chloride	1.2 "
Potassium cyanide	10.0 "
Potassium carbonate	100.0 "
Water	1 liter

Gountier's solution for plating wrought and cast iron is the following:[15]

Potassium ferrocyanide	30 grams
Cuprous chloride	15 "
Stannous chloride	40 "
Sodium thiosulphate	40 "
Water	1 liter

Roulz's solution[16] contains:

Copper cyanide	5 grams
Tin oxide	2 "
Potassium cyanide	40 "
Water	1 liter

Elsner's solution[17] is the following:

Copper sulphate	70 grams
Stannic chloride	8 "
Potassium hydroxide	Small amount
Water	1 liter

Solutions recommended by Weiss[18] are the following:

Cupric chloride	20 grams
Stannous chloride	10 "
Potassium carbonate	100 "
Potassium cyanide	10 "
Water	1 liter

This gives a more concentrated solution of copper and tin than Salzède's solution. The other solution recommended by Weiss contains:

Copper sulphate	64 grams
Stannic chloride	9 "
Potassium cyanide	128 "
Potassium hydroxide	Small amount
Water	1 liter

[14]Langbein: p. 336; Brannt: p. 247; McMillan: p. 287; Fontaine: p. 146.
[15]Brannt: p. 247.
[16]Brannt: p. 247; McMillan: p. 247.
[17]Brannt: p. 247; McMillan, p. 287.
[18]McMillan: p. 287.

TABLE II.
Solutions for Deposition of Bronze.

	Copper Carbonate	Copper Phosphate	Cupric Chloride	Cuprous Chloride	Copper Cyanide	Copper Sulphate	Tin Oxide	Stannous Chloride	Stannic Chloride	Stannous Oxalate	Sodium Stannate	Potassium Carbonate	Potassium Cyanide	Sodium Pyrophosphate	Potassium Ferrocyanide	Sodium Thiosulphate	Potassium Hydroxide	Rochelle Salt	Soda Lime	Ammonium Oxalate	Oxalic Acid	Water
1	37.5	..	..	...	..	..	7.5	..	..	..	..	15	203	..	..	..	..	...	..	..	..	1000
2	....	q. s.	..	...	..	..	...	q. s.	..	..	..	...	...	50	..	..	..	...	..	..	..	1000
3	....	..	..	1.5	..	..	...	1.2	..	..	..	100	10	..	..	..	..	...	..	..	..	1000
4	....	..	..	15	..	..	..	40	..	..	..	...	...	..	30	40	..	...	..	..	...	1000
5	....	..	..	...	5	..	2	..	..	..	..	...	40	..	..	..	..	...	..	..	..	1000
6	....	..	..	...	..	70	...	..	8	..	..	...	...	..	..	..	q. s.	...	..	..	..	1000
7	....	..	20	...	..	..	...	10	..	..	..	100	10	..	..	..	..	...	..	..	..	1000
8	....	..	..	...	..	64	...	..	9	..	..	...	128	..	..	..	q. s.	...	..	..	..	1000
9	....	..	..	...	..	35	...	..	..	..	q. s.	...	...	..	..	..	..	150	80	..	..	1000
10	....	..	..	...	..	15	...	..	..	4.2	..	...	...	..	..	..	..	...	..	55	5	1000
11	....	..	..	...	..	22	..	...	..	..	5.5	...	...	..	..	..	5	150	..	..	..	1000

These solutions are tabulated in Table II.

Weil's solution[19] follows:

Copper sulphate	35 grams
Sodium stannate	Sufficient to give required bronze
Soda-lime	80 grams
Rochelle salt	150 "
Water	1 liter

A solution recommended by Currie[20] contains:

Copper sulphate	15.0 grams
Stannous oxalate	4.2 "
Ammonium oxalate	55.0 grams
Oxalic acid	5.0 "
Water	1 liter

Another solution[21] which does not give satisfaction is the following:

Copper sulphate	22.0 grams
Sodium stannate	5.5 "
Sodium hydroxide	5.0 "
Rochelle salt	150.0 "
Water	1 liter

THE BRASS AND COPPER PLATING OF THE FUTURE

By E. G. Lovering.*

The progress in the electro deposition of metals has for the past few years been wonderful, from a manufacturing standpoint. It has brought out many new methods of producing results at a minimum cost, and when skilled men and up-to-date methods are used the manufacturer or employer is the gainer, as more and better work is turned out, with less expenditure. Therefore, methinks the employer of electroplaters should become more acquainted with the plating department and the methods used by their respective platers. Much has been said and written about electro cleaners, and they have become a valuable asset to the plater, as very few platers are today using the old potash cleaning process where the work was left in the potash tank over night to be cleaned, which the writer has done many a time in the distant past. But the electro cleaner has taken another step in the rapid march of progress, which the up-to-date plater will be sure to add to his "repertoire," as the most wonderful results have been obtained in the deposition of brass and copper, a la electro cleaner, as one might express it.

For the past year the writer has been depositing copper and brass on automobile parts, from his electro cleaning tank, that is, combining the cleaning and plating into one solution, actually doing away with the regular wood tanks formerly used for copper and brass plating. The same amount of work is being turned out of one tank per day that in the past required three wood tanks of the same size. A deposit of copper .009 inch thick was deposited in fifteen minutes. Our old method of brass plating automobile levers required two hours' plating in the regular brass solution to obtain a deposit of .002 to .003, but now we put on the same amount of metal in 15 to 20 minutes. A deposit of brass can be put on that will stand polishing on an oil polishing wheel, No. 180 emery, which is saying a good deal for a brass deposit. The work is received from the polisher, wiped with a piece of waste, then hung into the combination plating and cleaning tank. The work is electrically cleaned and plated at the same time, thus doing away with all extra transferring from one tank to another. The labor saved in this alone can be readily seen when one has to handle several hundred pieces in a day.

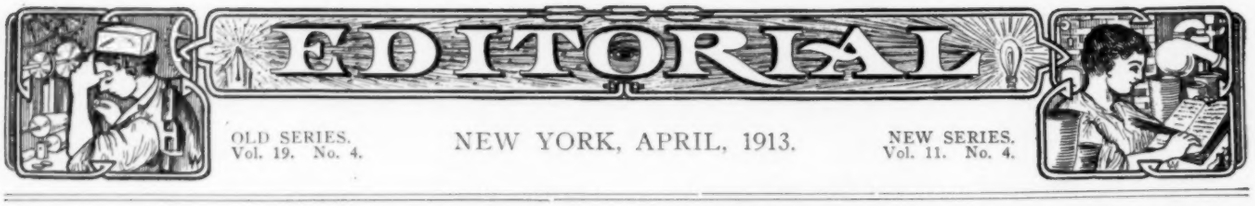
Aluminum can be successfully plated by this method, as the action of caustic potash (K O H) in solution cleans and keeps any oxide from forming while the deposit is instantaneous. Welded sheet iron tanks are used, as the solution must be kept at the boiling point. For brass plating the writer uses the following formula:

Hanson and Van Winkle XXX Lye "K O H"	½ pound
Copper carbonate ($CuCO_3$)	2 ounces
Zinc carbonate ($ZnCO_3$)	2 "
Ammonium carbonate (NH_4CO_2)	4 "
Potassium cyanide (KCyO)	4 "
Water	1 gallon

For copper plating the same formula is used, omitting the zinc carbonate ($ZnCO_3$).

A beautiful example of the silversmith's art: An Ostensorium for St. Paul's Cathedral at San Francisco, Cal. The piece is 32 inches high, weighs 25 pounds, and is made of silver and gilt. It was made entirely by hand, and is the work of H. Hoppe, silversmith, of San Francisco, Cal.

[19] McMillan: p. 287.
[20] Jour. Phys. Chem., 10, 515 (1906).
[21] Bennett: p. 266.
* Foreman Plater, Lewis Spring & Axle Company, Detroit, Mich.



OLD SERIES. Vol. 19. No. 4. NEW YORK, APRIL, 1913. NEW SERIES. Vol. 11. No. 4.

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

Published Monthly by
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JOHN B. WOODWARD - - - - - - - - - Secretary

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ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
TELEPHONE NUMBER, JOHN 689 CABLE ADDRESS, METALUSTRY

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PLATERS' SALTS AND COMPOUNDS

We published last month a communication from a reader who wanted information regarding the various nickel plating salts and other platers' compounds on the market. In this issue of THE METAL INDUSTRY we publish the story of the manufacturer of some of these compounds. We hope to publish more of these letters and think that in this way some disputed and misunderstood points and questions may be cleared up to the satisfaction of all concerned. "What is one man's meat is another man's poison" is as true in chemistry as in medical science, and if an intending purchaser would tell manufacturers just what he required and expected of certain compounds and for what purpose he desired to use them, we have no doubt that in ninety cases out of one hundred no trouble would result. The other ten cases may be put down to misinterpretation of directions.

Apropos of the above a subscriber wrote us for a formula, which was sent him. In a month or so he wrote, stating that the formula was absolutely no good and that he had been put to considerable expense through bad work caused by its failure. Visions of damage suits passed before the eyes of the editor until he noticed the last line of the letter which said, "I used nickel anodes." As the formula given out specially stated to use brass anodes and not nickel, it is easy to read the answer to that puzzle! Another case that may be mentioned is embodied in the story told us by a manufacturer. He sold a certain chemical to a rather well known house. Among the instructions was the direction to filter the solution before the addition of certain other chemicals. After an investigation which followed the strenuous letter of condemnation from the purchaser of the chemicals it was discovered that the solution has been filtered *after* the addition mentioned above.

These are the points which keep manufacturer and consumer at odds. It seems a bit unreasonable for a consumer to doubt statements made by a manufacturer who has spent years of time and lots of money to discover just those mistakes that he is trying to help the user to avoid. There is no doubt but that the advertisers in THE METAL INDUSTRY mean what they say. We believe that they do and we believe also that they know what their goods will do and that they are as a whole conservative rather than exaggerative. THE METAL INDUSTRY believes in the integrity and honesty of its advertisers and we have no doubt but that our faith will be justified in the future as it has been in the past.

OCCUPATIONAL DISEASES

In another part of this issue of THE METAL INDUSTRY we publish two items which are most happily coincident with each other. One of these items announces the appointment of a committee on occupational diseases in chemical trades by the New York section of the American Chemical Society. This committee, the personnel of which is most excellent, held a meeting on March seventh and decided:

"1. To notify the proper committees of the Legislature of the States of New York and New Jersey and the local municipal authorities that this committee existed, giving a statement as to the membership of the committee and to express the hope that the committees of the Legislature would call upon this committee for such general advice as they might wish to obtain; and

"2. To announce the objects of the committee in a number of publications that manufacturers might learn of its existence perhaps to utilize its services in investigations of their own problems of this character they might wish carried out."

The other item we refer to tells of the issuance of a specification by the New York State Department of Labor for the design, construction and operation of exhaust systems for grinding, polishing and buffing wheels prepared by William Newell, mechanical engineer of the department.

"These specifications are issued with the view of bringing about the efficient removal of dust from grinding and buffing wheels. Their object is to prevent the construction of exhaust systems on such faulty designs as making the main suction duct much too small and not infrequently the same size throughout its length, running the branch pipes into the main at right angles and sometimes at the bottom of the main, too small a fan, too small a discharge pipe from the fan, too small a cyclone separator or dust collector, etc., with the result that the suction is entirely inadequate to carry off the dust, which then clogs the ducts and spreads about the room, to the injury of the workmen's health.

"A room free from dust is also productive of higher efficiency of both men and machinery. It has been proven time and again in actual practice that the output of a workman is increased if he works under healthful atmospheric conditions. Freedom from dust is also conducive to less wear and friction, and hence longer life, of machinery.

"Lastly, these specifications will protect manufacturers from spending their money on useless exhaust systems installed by ignorant or careless contractors, which cannot be accepted by this department."

What better aid could the committee have than this specification as a guide and to model therefrom similar specifications for use in the chemical trades. We shall certainly follow the movements of this committee with great interest and stand ready to help in any way we can, and we invite expressions of opinion and suggestions of remedies, devices, etc., from our readers that will help the committee in this great work.

PLATERS' COMPOUNDS AND SALTS

TO THE EDITOR OF THE METAL INDUSTRY:

As we are also readers of your valuable paper pertaining to the metal industry we have noticed the communication published in your issue of March signed by the Lake City Plating Works of Chicago, Ill. In justice to ourselves we are compelled to take issue with these parties in regard to our red copper compound. It seems very amusing to us that a concern who has only used 10 pounds of this material, purchased here March 9, 1907, and again another order of 15 pounds, purchased August 1, 1907, would try to act as judges and criticise the value of this material, having only tried it in a small experimental way. We today have some of the largest users of red copper compound on our books who have continually used the same for almost nine years. Their orders come in here regularly and they simply would not do without it.

No doubt your paper knows that we originally brought this article into the market and many houses, a few years afterwards, commenced to make the same goods; some were very inferior. One here and there made a fair article, but we believe today that our brand of red copper compound is the standard article, as many of the old customers who changed off have come back to the original article. Certainly we cannot compel anyone to use any of these special materials unless they are willing to try the article out as per instructions and are willing to better their plating conditions.

As regards our new Chinisol nickel salts, time will tell what kind of an article we have, as we are leaving it to the consumer and a large number of houses who have used this article in the last two months have willingly paid their invoices, although the goods were all sent on approval to be shipped back at our expense. We had a few complaints where our customers made their solutions entirely too heavy, wasting the material, and also the bath would crystallize. This trouble is easily overcome by reducing the quantity used and saving considerable money thereby.

We have in this city during the last two weeks seen some wonderful results procured by this process and we do not intend to tell our friends to try these goods unless they try them on approval. Shortly we will be permitted by many concerns to relate their experience and give their testimonials on this particular article. Then we will be in a position to let the other fellow tell the plater what this material will do. It comes nearer a silver finish than any other nickel on the market. The results are obtained in a very short period. Therefore every factory's capacity is increased wonderfully. The initial cost may seem more, but in the end the cost is much less, as the bath runs indefinitely almost and you are taking nickel from the anodes which gives the best deposit anyone can obtain, being non-porous. We ask you to kindly publish this in justice to ourselves, our red copper compound and also to our new German Chinisol preparation.

FINKELL, HACHMEISTER CHEMICAL COMPANY.

Pittsburgh, Pa.

To the Editor of THE METAL INDUSTRY:

I note a communication in the March issue of THE METAL INDUSTRY from the Lake City Plating Works of Chicago, Ill., asking for information relating to the various new nickel salts that are being placed on the market. As far as the line of "Prometheus" nickel plating salts which I represent in this country I should be pleased to have you publish a few of the indorsements and testimonials which have been received by me during the past few weeks.

"I take great pleasure in telling you of the results I am getting with Dr. Frederich Neubeck's rapid nickel plating preparation,

'Prometheus.' It does all they claim for it, doing our work in one-third of the time of our old solutions. The anodes are always free from slime, requiring no cleaning. It produces a white deposit akin to silver without fear of burning or peeling."

..... WORKS,
By ..... Foreman Plating and Polishing Department.

"We have had 150 gallons of your solution working continually (5 months or more) and have added nothing but water to it, and at present writing it still stands 16° Beaumé. I have found it gives a good heavy deposit of nickel on steel in about one-half the time of an old solution of double and single salts. On cast iron it plates a very heavy deposit in twenty minutes which buffs up to a color of high lustre. On brass, which has been buffed to a high finish, we can get a heavy deposit which does not need coloring." ..... COMPANY,
By ..... Foreman Plater.

"We are pleased to state that we are well pleased with your 'Prometheus' rapid nickel plating salt, and intend to use it in all of our tanks, and that we can plate so much more rapidly with Prometheus than in the old way that we will probably be able to do all of our work in one large tank instead of three tanks, as heretofore." ..... WORKS,
By Vice-President & General Manager.

"Enclosed please find our check for the 110 pounds of nickel salt made by Dr. Neubeck of Germany, and which we find is superior to the salts we purchase in this country. Please book us for another order of 110 pounds, and let us have it as soon as possible. ..... COMPANY,
By President.

"We are pleased to state that the nickel salts sold by you, under the name of 'Prometheus,' is proving a very efficient compound. We find that the time required is exactly as stated by you, in fact we believe a deposit can be made in one-quarter of the time that an ordinary solution with regular nickel salts requires. We can certainly recommend it highly and are assured that anyone will find the material as represented.

"We enclose herewith our order No. 6954 for three hundred and thirty pounds, which please give your prompt attention."

..... WORKS,
By ..... Purchasing Agent.

"We are pleased to advise that the results we have obtained from Prometheus Rapid Nickel Plating Salts are everything that could be desired. This class of work we have had done formerly by a specialist in the line, and the results we obtain with the new solution, being worked by an unskilled operator, exceeds anything we have had done before." ..... COMPANY,
By ..... Supt.

"We are using the Neubeck Nickel Salts and so far have found them to be all that is claimed; our plater states that they are the best salts he has ever used. We can safely recommend them to anyone who does nickel plating, if used according to directions."

..... COMPANY.
By ..... Treasurer.

Copies of the originals from which the above quotations are taken may be seen at my office, 126 Fifth avenue, New York, N. Y. ADOLF NEUBECK, Importer.

April 2, 1913.

MANUFACTURING EFFICIENCY

To the Editor of The Metal Industry:

In reply to "T. E. G.'s" criticism in the March issue of The Metal Industry of my article on "Increasing the Efficiency of a Brass Manufacturing Plant," I have the following to say: "T. E. G." says he would much prefer that the expert be not of the department who should study the methods and operations of the ordinary workman. You could not take a man from the polishing department and put him in the foundry. He also says a few months in the machine or tool shop will broaden and increase his knowledge of automatic machinery. I admit he is correct in this, but I desire to inform him from my own personal experience that in ninety per cent. of the improvements in tools and machines and methods of production of goods the suggestions have come from the operators of these machines and not from anyone connected with machine or tool shop.

Second, "T. E. G." objects to assigning a specified amount for a day's work, as it will limit the output. I will refer him to my article in the March issue where a molder has to put up a certain amount of molds for a day's work. All over and above this amount he is paid a bonus, so I fail to see where it limits the output should he fail to put up that assigned amount any day. There is an investigation made that day to find out where the trouble is, whether in patterns, flasks, sand or machine, and if found it can be attended to at once or whether the cause is due to inefficiency of the person.

Third, "T. E. G." does not agree with me, as I prefer the bonus or premium system in preference to the piece work system. If he will read the article carefully he will see there is no slipshod methods adopted in setting the prices, as the expert in each department that has any work to do on the different parts has devised the best ways and means and record of time on them. Rates can be set so that they can be guaranteed for one year, and when so set they should not be changed. However, if the company devises better methods the price is revised accordingly, but if the employee himself devises an improved method his price is not cut but is allowed the full benefit for a year. Confidence of employees in their employers to allow them to earn good wages in return for good efforts gives them an impetus to do their best. Therefore, the man that is doing 1,500 pieces per day against the other man doing 1,000 is the one that is benefiting himself financially and also his employer.

P. W. BLAIR.

Decatur, Ill., March 19, 1913.

NEW BOOKS

SCIENTIFIC AMERICAN REFERENCE BOOK. By Albert A. Hopkins and A. Russell Bond. 1913. Size 6 by 8 inches. 598 pages and 1,000 illustrations. Bound in boards. Published by Munn & Company, New York. Price, $1.50. For sale by THE METAL INDUSTRY.

This book constitutes one of the most valuable works of reference that has yet been published. It is divided into two parts, the first of which contains statistical information and consists of sixteen chapters, covering a great range of popular topics of everyday use. The second part is devoted to scientific information and contains six chapters which treat of chemistry, astronomy, machine elements, mechanical movements, geometrical constructions and weights and measures. Taking the work as a whole it cannot fail to be a veritable aid and, in fact, is a necessary adjunct to any library. We take great pleasure in recommending it to anyone who has a desire to learn about the most interesting things in the world in which he lives.

TRANSACTIONS OF THE AMERICAN ELECTROCHEMICAL SOCIETY. Vol. XXII, 1912. Size, 9 by 6 inches. 515 pages with index and numerous illustrations. Bound in cloth. Published by the society. Joseph W. Richards, secretary, South Bethlehem, Pa.

The major portion of the book is taken up with the papers read at the twenty-second general meeting of the saciety, held in New York, September 7-10, 1912, held in joint session with the Eighth International Congress of Applied Chemistry, making a total of thirty-seven papers. The proceedings of this twenty-second meeting are also given, together with a list of the members and guests registered. Alphabetical and geographical directories of the members are given which show that the society is rapidly approaching the 1,500 mark. The frontispiece is a full-page half-tone portrait of Dr. William H. Nichols, president of the Eighth International Congress of Applied Chemistry.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Will you kindly tell us the composition of white metal and German silver?

A.—It is difficult to give formulæ unless the purpose for which the metal is to be used is known. The following are a few formulæ:

ENGLISH WHITE METAL.

Tin	53
Lead	33
Copper	2.4
Zinc	1
Antimony	10.6

This alloy melts at 290 degs. F.

A WHITE METAL COMPOSITION.

Tin	85
Antimony	10
Copper	5

A STOP COCK ALLOY which deposits no verdigris.

Zinc	72
Tin	21
Copper	7

AN ALLOY FOR ANTI-FRICTION BRASSES.

Zinc	80
Tin	14
Copper	5
Nickel	1

German silver may range as follows:

Copper	50 to 66 parts
Zinc	19 to 31 parts
Nickel	4 to 25 parts

For spoons, forks, cups, candlesticks, etc., alloys of copper 50, nickel 25 and zinc 25 are most suitable. In fact, German silver runs from 4 to 25 per cent. of nickel with varying quantities of copper and zinc according to the purpose for which the alloy is intended.—K.

BRASSING

Q.—Will you kindly publish a formula for brass dip for wrought iron?

A.—In your inquiry you ask for a brass dip for wrought iron. We do not understand this question. You probably require a formula for a brass solution for plating wrought iron. A formula for this purpose should consist of the following proportions:

Water	1 gallon
Cyanide of potassium	8 ounces
Carbonate of Copper	4 ounces
Carbonate of Zinc	2 ounces
Sodium Bisulphite	1 ounce
20% Ammonia	¼ ounce

To prepare the solution dissolve the metal salts in part of the water, then add the bisulphite of soda; dissolve the cyanide in the balance of the water and mix with the metal salts. When the solution is set up in working condition charge the bath for one or two hours by hanging anodes on the work pole; if the color does not come up a good yellow add the ammonia.

For nickel plating cast iron use a solution composed as follows:

Water	1 gallon
Double nickel salts	8 ounces
Single nickel salts	2 ounces
*Sulphate of Magnesium	4 ounces

Use cast nickel anodes.

*Sulphate of magnesium is the Epsom salts of commerce.

Commercial muriatic acid is always used for pickles. The strength may be from the undiluted acid to one part acid to 25 parts water. The usual strength used for the first dip is equal parts of acid and water; for the final dip one part acid and four parts water.—C. H. P.

CASTING

Q.—I am having trouble with my light yellow brass castings going bad; that is, they show blow holes. I am using a mixture of:

Ingot Copper	145 lbs.
Zinc	72½ "
Lead	5 "
Scrap Brass	70 "
Turnings	100 "

A.—The blow holes in your castings are due to your mixture. Assuming that your scrap brass contains 5 or 6 per cent. of tin, your mixture may be estimated to be about as follows: Copper 65, tin 1, lead 2, zinc 32. Such a metal is not very fluid and hence does not free itself well from dissolved gases or give castings with a good surface unless skin-dried molds are used. We advise the use of the following mixture:

Copper	76
Tin	3
Lead	3
Zinc	18

The use of turnings in a mixture is not economical and will in itself often cause blow holes. They are best run down alone, and the resulting ingot metal added to the mixture. It is a good plan to buy ingot brass made to your own specification by a reliable smelter.—J. L. S.

COLORING

Q.—I am sending you a pair of clock hands that have taken a fair blue, while the others are very uneven in color. I want to remove the bluing and then blue by heating. Can you tell me how to do this?

A.—The blued surface can be readily removed from the hands by a few moments' immersion in a solution of muriatic acid, 1 part; water, 5 to 10 parts. Wash the hands carefully in water and dry out by the aid of gasoline and sawdust to prevent rusting.

There are a number of methods for bluing with heat; one is, heat lead to 600 degs. F., and then immerse until sufficiently blue; cool in kerosene oil and dry in sawdust. Heat sea sand in iron boxes to the same temperature and cover the articles to a depth of one inch. Wood ashes will give the same results, also powdered charcoal.

A method used by some concerns for bluing in quantities is to erect a round iron oven with a shaft running through and revolve slowly with power. Upon the shaft are arranged frames similar to the boats of a ferris wheel. The hands are placed in rows upon an additional frame, that can be hung readily to the shaft frame. This gives a constant motion to the articles while bluing in one position. The heat may be produced from gas, coke or small coal as desired.—C. H. P.

DEPOSITING

Q.—I am having trouble in my nickel-plating solution with the salts depositing on the racks which hold the work. However, the quality of the deposit, is excellent and the solution stands at 6½ degrees Baumê.

A.—Your nickel solution is slightly too concentrated for this

time of the year. If you reduce the density to 5½ degrees Baumê with water, the crystallization on your frames will be overcome. If you do not wish to reduce the density of the solution, then its temperature will have to be increased to 65 or 70 degrees. This you can readily do if you have steam, by running a length of lead pipe through the solution and connect with your steam line. Arrange to have a valve on the inlet and outlet; by allowing the steam full headway with an open valve on the inlet and the outlet only sufficiently open to relieve the water of condensation, you can raise the temperature of the bath very quickly. To overcome crystallization, this method is extensively used in the winter time with good results.—C. H. P.

MEDICAL

Q.—Kindly inform me what causes red blisters to break out on the hands and arms of persons working in a nickel-plating room, and is there any remedy for the same?

A.—Very many platers become infected with skin trouble that originates from contact with nickel solutions in the manner that you are affected. We suggest that you procure some sulphur and cream of tartar tablets and take one, three times a day, and occasionally take a good physic, such as solution of citrate of magnesia. At the close of the day's work wash the hands and arms thoroughly with very warm water, using a teaspoonful of carbolic acid to each quart of water. Then, on retiring, rub carbolic ointment into the skin. Do not apply too much, but rub in thoroughly and in a short time your trouble will disappear. However, as you are always liable to become re-infected, it is advisable to continue the use of the carbolic wash as a future preventative when the sores have been healed.—C. H. P.

PICKLING

Q.—Please give me a pickle to take the sand off of castings before plating.

A.—The best material to use is hydrofluoric acid, as this reduces silica when burnt in the metal. To prepare a pickle for the purpose, procure a tank of sufficient size and line it with coal tar asphaltum. This should be previously melted and applied while hot. If too brittle when applied, a small amount of coal tar should be added to reduce the brittleness. A good test is to drop a small amount of the asphaltum in water when melted; if it snaps like glass, add the tar until more flexible, and then apply to the wood. Or the tank may be lined with sheet lead and burnt in. This gives the best results because the solution can be heated and the same removed more readily. The solution should consist of 20 parts acid to 80 parts water, but a slight variation makes no difference. The sand should be removed in fifteen to twenty minutes. The castings should then be washed and immersed in boiling water to which is added 1 to 2 per cent. of sal soda per gallon. This will neutralize the acid in the pores of the metal and is then ready for further operations of cleaning and polishing, if so required. Instead of using asphaltum, a material called Mogul may be purchased for lining tanks, as it gives good results.—C. H. P.

PLATING

Q.—Kindly publish a formula for a lead plating solution, one that will give a heavy deposit.

A.—The following formula when used at a temperature of 170 to 180 degs. and a pressure of 3 to 4 volts gives good results:

Water	1 gal.
Caustic Potash	5 ozs.
Acetate of Lead	1½ "

Use anodes of pure sheet lead.—C. H. P.

POLISHING

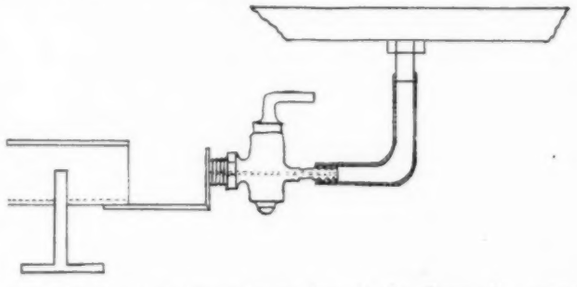
Q.—We would like to get information regarding repolishing steel, such as razors or shears, that have become slightly shop worn or rusty.

A.—As the articles you mention do not require much labor to renew the original finish we suggest that you procure from any plater's supply house several felt wheels about 4 inches in diameter and ½ to ¾ inch face. Run these wheels at 3,000 to 3,500 r. p. m., using as the polishing medium tripoli composition or the finest grade of emery composition. Apply a little to the felt wheels to remove rust and bring back the natural finish. It may be necessary to use a finishing wheel, which may consist of a felt wheel or one made up of sections of unbleached muslin of the same dimensions, using as the finish mediums crocus, Vienna lime or rouge compositions. These may be procured from the same concerns who furnish the felt wheels. Articles that are badly rusted in spots should be polished by using coarser grades of emery composition, or by immersing in equal parts of muriatic acid and water, but such articles should be carefully washed and dried afterwards.—C. H. P.

SOLDERING

Q.—What is the best kind of a gas heater to use for a soldering iron on small work or home use?

A.—The gas companies have a display of these goods in their show rooms in many varieties. A useful little tool and one easily made which can be adapted to all kinds of soldering and well worth the trouble taken to make it is as follows: Take a piece of 2-inch pipe about 6 inches long. Around the



center of it bend a piece of strap iron in the shape of a counter pin. This forms a standard to hold the gas heater. On one end of the pipe, rivet a piece of strap iron that has been bent at right angles as shown in sketch. In the upright part of this piece and facing the end of the pipe and exactly centering the 2-inch hole, bore and tap a hole to receive a gas hose cock with an outlet of 1/16 of an ich. An ordinary piece of rubber gas tubing of sufficient length may be fastened to the gas hose cock and then attached to gas jet or service pipe. The drawing will give the proper idea of how the heater is used. The amount of flame can easily be adjusted to the gas pressure by the regulating of the hose cock on the supply.—P. W. B.

RESISTING

Q.—We would like to know something about a wax used as a resist when etching on brass, such wax upon cooling to crack in fine lines similar to the grain on morocco leather.

A.—We do not know of a wax that will accomplish what you mention, but there is a glue called the French Star Glue that is applied hot and on cooling cracks in the manner you state. This glue is used to produce the frosted effect on mirrors (usually seen in cafés). This may answer the purpose and should stand an acid sufficiently strong for etching.—C. H. P.

Q.—I would like to have a formula for a resist varnish for etching names on steel knives.

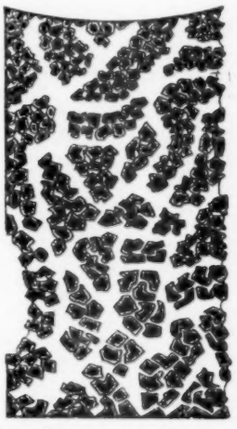
A.—The resist you refer to is gum guiacum dissolved in denatured alcohol. To prepare the resist dissolve sufficient of the gum in denatured alcohol to produce a solution of the consistency of oil, allow the residue to settle and then filter through filtering paper. The varnish should be colored with aniline red, so that it can be readily seen, soluble in alcohol. Other colors of a like nature may be used. Some little experimenting will be required to obtain the resist of the right consistency, so that the caustic soda will readily eat through. The knives should be slightly warmed before applying the resist to assist in drying the varnish.—C. H. P.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

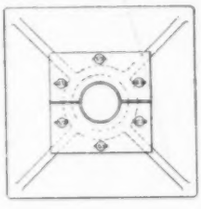
1,051,814. January 28, 1913. **Process of Manufacturing Porous Metal Blocks.** Victor Löwendahl, Stockholm, Sweden.

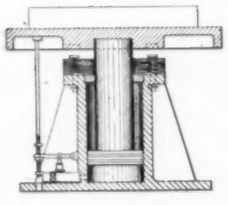
This invention relates to an improved process of manufacturing porous metal blocks, as shown in cut. Substances composed of a mixture of metal and carbon and used, for instance, as brushes for electric machines suffer from the disadvantage that the carbon which in the form of natural graphite is added partly as lubricant and partly to effect a suitable electric conductive and contact resistance, wears off quicker than the metal, so that the contact surface becomes almost purely metallic and thus will be devoid of both lubricant and contact resistance, whereby the purpose of the admixture of the carbon is rendered ineffectual.



The object of the present invention is to avoid such disadvantage by using, instead of carbon, other impregnating substances, that neither reduce the prominent qualities of bronze-carbon material, nor are influenced by the sparking. Among the substances, which can be used for this purpose, are, for instance, oil, paraffin and others.

1,052,086. February 4, 1913. **Jolt Ramming Apparatus.** Edgar H. Mumford, Plainfield, N. J. Assignor to S. C. Mumford, Detroit, Mich.





The invention relates to jolt ramming apparatus, and particularly to the impact receiving means and has for its primary object: the provision of an improved and simplified impact receiving device so arranged and constructed as to deaden the impact incident to the drop of the table, and thereby reduce the tendency of the sand in the molds carried by the table to rebound and loosen. One embodiment of the invention is illustrated in the accompanying drawing.

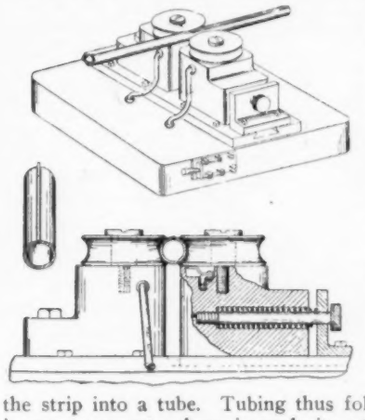
1,055,119. March 4, 1913. **Alloy of Platinum and Osmium.** Fritz Zimmermann, of Newark, N. J., assignor to Baker & Company, of Newark, N. J., a corporation of New Jersey.

This invention relates to alloys of platinum and osmium which combine in a high degree the property of great hardness with tensile strength and are applicable for use in the arts, chiefly for jewelry, electrical and scientific purposes. For melting platinum and osmium together, it is necessary to refine the platinum and osmium of commerce to a high degree of purity so as to remove from the platinum the small quantities of metals of the platinum group and other impurities, and the impurities contained in the osmium. It is well known that platinum, as found in nature, contains osmium as well as other metals of the platinum group; also copper and iron, but it is impossible to make use of this natural product as an alloy, as the presence of the other metals impairs the good properties of the osmium-platinum alloy.

The invention claims: Alloys of platinum and osmium, containing refined platinum and refined osmium in the proportion of less than ½ per cent. to 30 per cent.

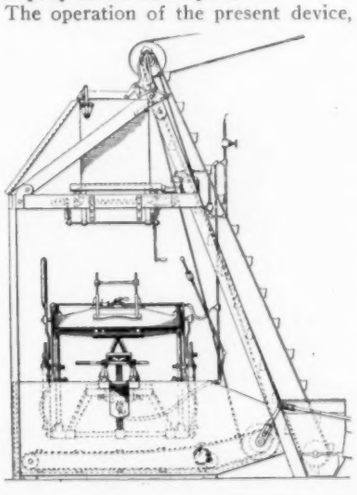
1,052,820. February 11, 1913. **Process of Brazing Tubing.** H. Higgin, New Park, Ky. Assignor to the Higgin Manufacturing Company of the same place.

In the process of the manufacture of brass tubing and the like provided with a longitudinal seam, great difficulty is experienced and heavy loss incurred in soldering or brazing the seam so that there shall be no parting at the joint. Such seamed tubes are usually manufactured from sheets of brass or the like cut into strips of uniform width to make a tube of the desired diameter, and the tube is formed by running the strip between dies graded in shape to gradually fold the strip into a tube. Tubing thus folded into cylindrical shape is very prone to show irregularity at the seam; the edges, in places, overlap, and at other places gap apart. Now when the unfinished tube is placed in the brazing furnace and heated to brazing temperature, with the tube supported only at the edge of the furnace and exposed to the heat, between bearings 18 inches to 24 inches apart, as is usually the case, it is almost a matter of luck whether the brazed seam will hold, and the loss from defective joints is very large. This invention has discovered, however, that such tubing may be very successfully welded or brazed electrically, with a percentage of loss from open joints practically negligible, especially where the tubing has been accurately folded from the strip. The cut shows how this process is carried out.



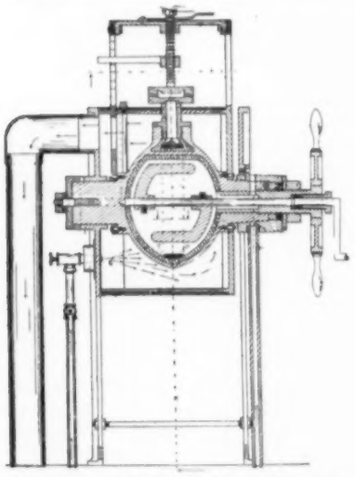
1,053,681. February 18, 1913. **Molding Machine.** Henry Tscherning, Freeport, Ill. Assignor to Arcade Manufacturing Company of the same place.

The operation of the present device, as shown in cut, is substantially as follows: The head is first swung back so as to clear the table or support for the flask. The sand-dropping mechanism is then operated and the sand showers into the flask, filling one side thereof. The flask is then turned over, the sand-dropping mechanism again operated and the second half of the flask is thus filled. The flask is then placed in position, follower boards are added and the operating handle is grasped and drawn forward. This swings the head



forward to a position immediately over the flask whereupon a continued movement of the operating handle depresses the presser plate, thus squeezing the contents of the flask.

1,053,132. February 11, 1913. **Die Casting Machine.** L. M. Parkhurst, Anderson, Ind. Assignor to Indiana Die Casting Development Company of the same place.

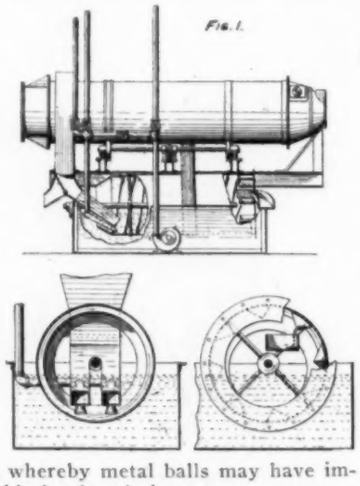


The object of this invention is to provide an improved die casting machine, as shown in cut, extremely simple in construction, formed relatively of few parts and easily operated so that skilled mechanics are not required. It is capable of making castings rapidly and dies may be placed and removed as the machine operates, and it automatically agitates the metal in the melting pot, and is capable of making dies from a wide range of metals, and is valveless, and has other features and advantages which will hereafter appear.

The chief feature of the invention whereby many of the above results are brought about is in making a movable or tilting, oscillatable or invertible melting pot, and making it all of one piece practically and the wall thereof free from valves so that it can be lined with graphite or other materials ordinarily used in making crucibles whereby various metals and alloys can be melted and cast without difficulty. Along with the oscillatable melting pot is an arrangement for supplying a gaseous fluid under pressure, such as atmospheric air or other gas therein for forcing the metal into the die, which compressed air is turned off and on by the mere movement of the pot.

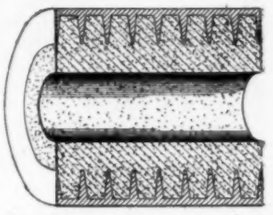
1,054,038. February 25, 1913. **Mechanism for Hardening Metal Balls.** Otto W. Schaum, Philadelphia, Pa.

This invention relates to mechanism for hardening metal balls, and more particularly such balls as are to be subsequently employed for anti-friction purposes. In order that metal balls of this general type may properly withstand the excessive wear and strains to which they are subjected in use, they must not only be homogeneous and uniform in character, but they must be properly and uniformly hardened, and with this general object in view the aims and purposes of the present invention are to provide means, as shown in cut, simple in construction, efficient and reliable in operation, whereby metal balls may have imparted to them the desirable hardened character.



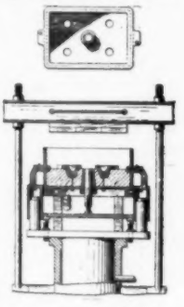
1,054,265. February 25, 1913. **Anti-friction Device.** Leo H. Baekeland, of Yonkers, N. Y., assignor to General Bakelite Company, of New York, N. Y., a corporation of New York.

This invention relates to the manufacture of anti-friction devices such as bearings, bushings, washers, etc., the object of the invention being the provision of a bearing or like device which is self-lubricating, smooth and durable, which possesses a low co-efficient of friction and is not subject to injury by heating. The bearing, as shown in cut, is well adapted for use in connection with high speed rotary shafts or the like and is efficient under heavy loads. This bearing surface comprises graphite mixed with or incorporated in a hard and infusible condensation product of phenols and formaldehyde, the preferred material being a hard, insoluble and infusible synthetic condensation product resulting from the reaction of formaldehyde upon phenol or a phenolic body under certain conditions. Graphite alone may be incorporated with the material, although it is preferred to add a suitable filling having a strengthening or hardening effect, the character and proportion of such filling being such that the co-efficient of friction is not unduly increased. As example of such materials may be mentioned asbestos, talc, soapstone, wood-pulp, slate and pulverized metals.



1,054,294. February 25, 1913. **Molding Machine.** Charles F. Hopkins, of Philadelphia, Pa., assignor to Ajax Metal Company, of Philadelphia, Pa., a corporation of Pennsylvania.

The principal object of the present invention is to avoid hand-ramming and hand-drawing and to provide, without splitting the pattern and machining the joints, a comparatively inexpensive split pattern, as shown in cut, that will coöperate with a power molding machine and give successful molds without requiring skill on the part of the operator.

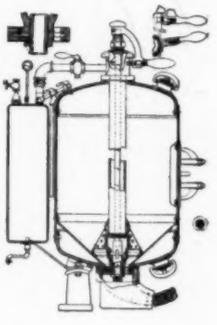


The machine is covered by the following claim among others:

In a molding machine the combination of a pattern carrier, a flask frame, means for moving the carrier and frame in respect to each other to draw a pattern, means for moving the carrier and frame together to ram, a pattern box containing a filling of which the face contour controls the parting and the part of the patern that extends beyond the parting, and flask guide pins connected with the pattern box, in contra-distinction to any part of the molding machine, whereby the proper position of said part of the pattern in respect to the pins and to the other part of the pattern is insured and maintained.

1,054,775. March 4, 1913. **Sand Blast Apparatus.** Foster J. Hull, of Brooklyn, N. Y., assignor to Thomas W. Pangborn Company, of Jersey City, N. J., a corporation of New Jersey.

This invention relates to improvements in sand blast apparatus, and comprises an improved sand-container and improved sand-and-air mixing means, together with an improved valve controlling the delivery of the sand from the container.



The objects of the invention are to improve and simplify sand blast apparatus, to provide improved and effective means for regulating the action of such apparatus, as shown in cut, and to so construct the sand-delivery valve of the apparatus that the portion thereof subject to material wear may be renewed readily.

1,054,789. March 4, 1913. **Die Casting Machine.** Layton M. Parkhurst, of Indianapolis, Ind., assignor to the Indiana Die Casting Development Company, a corporation of Indiana.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE COWAN TRANSVEYOR

This machine, manufactured by the Cowan Truck Company, Holyoke, Mass., might be called a lifting and carrying truck. The Cowan Transveyor, used in connection with inexpensive wooden platforms, makes possible the systematizing of trucking within a factory in a way that has never existed before the advent of this proposition upon the market. Inside transportation or "trucking within the factory" has always been considered in most plants as "one of those little things that is everybody's business," and consequently no one has ever taken

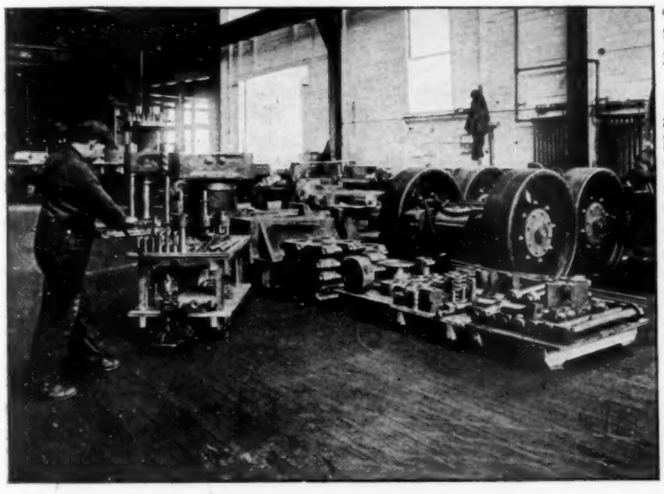


FIG. 1. THE COWAN TRANSVEYOR IN THE PLANT OF THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

the trouble to ascertain if the trucking within the factory was being done in the most economical way possible. It is not surprising then that many plants should find themselves with antiquated systems of trucking. To explain the operation of the Cowan trucking system it is only necessary for one to picture to themselves a stock room or working room in the factory where all of the stock and material has been piled upon wooden platforms, which stand about 6 inches from the floor. These platforms vary in size from 23 inches to 44 inches in width, and from 22 inches to 64 inches in length.

Racks, boxes and other forms of construction are built upon the wooden platforms, depending upon the kind of material to be handled, and each factory manager can adopt the type of construction that will fill his needs. With the stock and material piled upon these wooden platforms it is only necessary, in order to move the load, to simply push the Cowan Transveyor under the platform and depress the handle. This elevates the wooden platform from the floor and automatically locks it in place, leaving a free handle with which to haul the load. The clearance under the platform, after the transveyor is elevated, is 1⅝ inches, and this clearance has been found to meet all the working conditions of any modern factory. The loading of stock and material is practically an instantaneous operation, and to unload, the operation is fully as simple as it consists of merely pressing a foot pedal and by raising the handle to a perpendicular position slowly allow the load to come to the floor without shock or jar. The transveyor is then pulled from beneath the platform and is ready to elevate and haul another load.

One of the Cowan Transveyors will handle, under ordinary conditions, one hundred of the inexpensive wooden platforms—in some mills they are using many more than this, in fact, in one of the divisions of the United States Envelope Company, in Worcester, Mass., they are using twenty-five hundred platforms with only five of the Cowan Transveyors. To equip a factory with the Cowan trucking system costs, it is said, about one-fifth of the amount necessary to equip a factory with the old style trucks, and after having placed this system in over one thousand factories throughout the country and compiling careful statistics of the economies effected, the Cowan Company feel exceptionally sure of their statement that they can cut the cost of transportation inside the factory in half, or in other words that they do the "inside the factory" trucking for one-half present costs.

Another feature of this system is that the orderliness of any factory is greatly increased, and increased orderliness means an increased general efficiency. There are no truck handles lying around to stumble over and accidents are thereby prevented. It is claimed to be possible with the Cowan system to stack the platforms as shown in Fig. 3. Twenty-five of the Cowan platforms, each of which will do the work of an ordinary truck, can be placed in a space, when the platforms are not in use, that is equivalent to the space occupied by one old style truck, or in other words, if twenty-five old style trucks were lying idle they would take up twenty-five times as much room as twenty-five of the Cowan platforms when lying idle. A big feature of this system also is the elasticity of the same. If there are heavy receipts in any factory and additional trucks are needed it is only necessary to put one of the carpenters to work building the inexpensive platforms, for in one day he can build twenty or twenty-five of the platforms, and each one of them will do the work of an ordinary truck. One of the greatest trials in any factory is the lack, at times, during the rush season, of a sufficient number of trucks. This is never the case in factories equipped with the Cowan trucking system, for they can have additional trucks in an hour's time at a very small cost—this cost ranging from 50 cents to $1.50, and representing about one-tenth the cost of an old style truck of the same size.

The Cowan Company appreciate that systems do not grow like

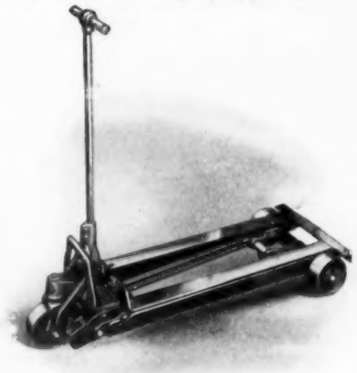


FIG. 2. THE COWAN TRANSVEYOR.

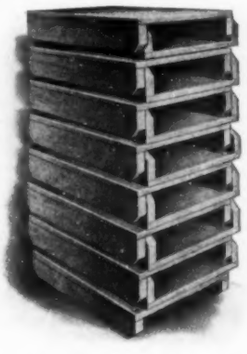


FIG. 3. SHOWING HOW PLATFORMS ARE STACKED.

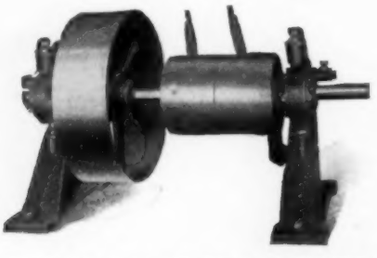
garden plants—they have to be worked out, and with this idea in mind they have traveling upon the road twenty-one men who are experts in factory transportation. These men will go into any factory and look over the working conditions, and after giving the same due study will make a report advising the best system of transportation to install. The Cowan Company, its officers and directors are men interested in the problem of increasing general efficiency.

GARDNER BALL BEARING LATHE

The New Gardner Ball Bearing Lathe shown in the cut, Fig. 1, it is claimed by the manufacturer, marks a turning point in the polishing industry. Polishers have long had to contend with worn-out bearings and imperfect spindles, resulting in large repair and power bills, small output and second-rate quality of finish. But the new Gardner Lathes put an end to these unsatisfactory conditions.

THE GARDNER BALL BEARING LATHE.

These Ball Bearing Lathes are made in a number of different sizes and in both floor and bench types. The cut shows the No. 3 floor type, with underbelt drive. The total length of the 2-inch diameter spindle is 49⅛ inches, with an arbor 1¼ inch in diameter, the spindle projection on each side being 15 inches. They make three smaller sizes, in both floor and bench types, designated No. 2, No. 1 and No. 0. In this smallest size (No. 0) the total length of the 1-inch diameter spindle is 15 inches, with an arbor of ½-inch diameter, the spindle projection being 4 inches. Three different types of spindle pulleys can be furnished. Either one tight pulley, a two-step tight pulley, or a tight and loose pulley, the loose pulley being fitted with ball bearings. Special spindles will be made on order.

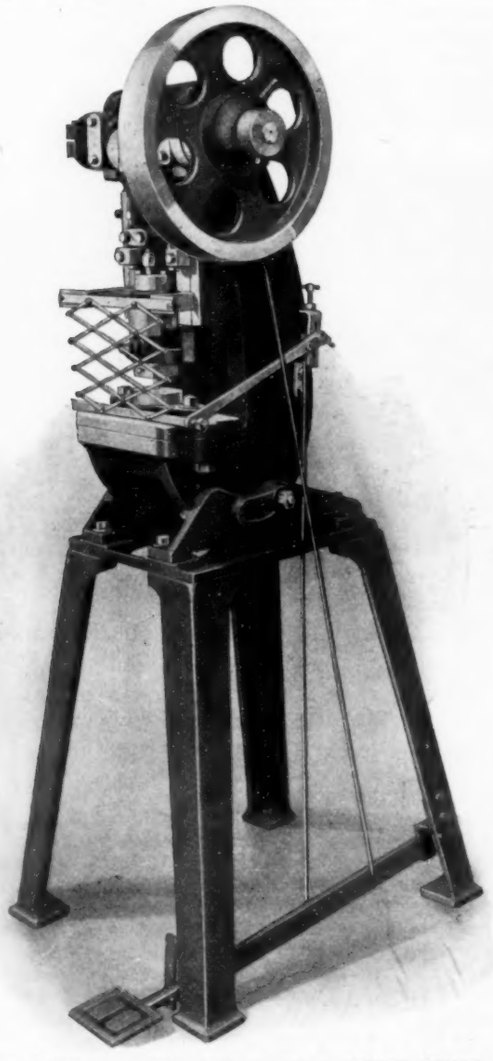


THE GARDNER BALL BEARING COUNTERSHAFT.

The Ball Bearing Countershaft, as shown in Fig. 2, offers another opportunity for reducing power consumption and repair bills. These countershafts can be furnished with either ball or high grade babbitted bearings. In the ball bearing countershaft the loose pulley is fitted with ball bearings as well as the bearing boxes. For further information regarding these machines inquire for folder B-B Polishing Lathes, Gardner Machine Company, Beloit, Wis.

SAFE-GUARDING DEVICE

The accompanying cut shows a simple, reliable and efficient safe-guarding device for use on punching, stamping and forming presses. This device is a folding gate which extends itself downward, and effectually blocks the approach to the die. This device, which is called the Cream City Accident Preventor, can be adjusted so fine that even an article one-eighth inch in thickness will prevent the tripping of the press. As the punch completes the operation, this folding gate jumps instantly back into a folded position entirely out of the workman's way.



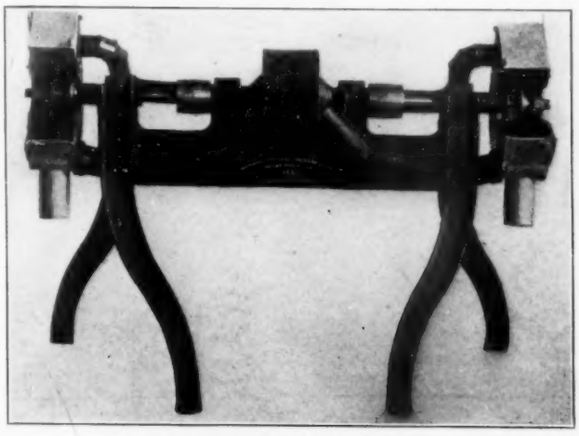
THE SAFE-GUARDING DEVICE ON A POWER PRESS.

A simple lever fulcrumed to one side of the press-frame is connected by a strong rod with the folding gate and with the clutch treadle. This lever unfolds the gate promptly in advance of the descent of the punch. If, while gate is descending, the operator interferes with his fingers or introduces anything down to one-eighth of an inch in thickness the lever does not engage the clutch pin and the punch cannot descend.

It is said that this device does not reduce the output of the press, nor interfere with rapid handling of the work in hand; neither does the workman have to dodge his head around to see the work. This machine is manufactured by Geuder, Paeschke & Frey Company, "The Valley," Milwaukee, Wis., who will be pleased to furnish additional information.

DUSTLESS POLISHING LATHE

The removal of waste material from machines in industrial plants by the means of fans or blowers has been in general use for seventy years. It is the most efficient and satisfactory method known; yet even now the minimum velocity or volume of air required to convey substances of varying specific volumes and densities is not known to any definite extent. About the time the general form of hoods and pipe sizes had been standardized, considerable stir was created by the inventors of "dust separators" or "dust collectors." These were used to trade on for many years, most extravagant claims being made for some of them. Within the past ten years the exhaust fans have been employed more extensively in the metal industry for the removal of dust from emery wheels, polishing and buffing wheels than ever before, and in nearly every state in the Union, laws have been passed compelling the use of them. The use of fans in the metal industry is unlike their use in other lines of industries where the collecting of shavings, lint, etc., is used as a by-product



THE ATHY DUSTLESS POLISHING LATHE.

and some benefit derived by the manufacturer for the expense of running a blower, but in the metal industry there is no benefit whatever derived by the manufacturer to defray the expense of running the blower.

The problem of how to eliminate the expensive blower system has been solved by C. F. Athy, of the Dust-Less Lathe and Supply Company, 2464 E. 34th street, Cleveland, Ohio, who has invented and applied for a patent on a new lathe which combines the lathe and blower equipment in one single unit. The machine has been designed to run as a double polishing or buffing lathe, and has two independent spindles. Each of these two spindles has its own suction fan, permitting two workmen on the same machine to be independent of each other. The one may stop and change his wheel or for any other purpose, while the other continues his work. The main feature of this lathe, however, is the self-contained exhaust system. Each of the two spindles has its own suction fan, which is housed in the case in the middle of the lathe. This housing contains two separate exhaust fans, constructed right and left so it can be worked together or separately, and consequently one spindle can be run while the other is idle, and the exhaust system works just the same. The further advantage that this system offers is the fact that the fan is so very near the wheel, not more than three feet, that the action is absolutely positive and it exhausts every bit of dust and dirt from the wheel. In so many small shops where the expense in installing a separate exhaust system is prohibitive, this takes care of that requirement, in good shape, and the cost of the installation is very slightly over the cost of a lathe proper.

Frederic B. Stevens, the well-known dealer in platers' and polishers' supplies, of Detroit, Michigan, has taken over the sales management of this lathe for the inventor.

THE NEWEST SALESMAN

The J. W. Paxson Co. have introduced a new method of showing their wares at the works of their patrons or at the most available hotel where a sheet may be hung, or a white wall be found, saving time and expense of the busy foundryman leaving his surroundings. This is accomplished by a new electric stereopticon that may be attached to any electric lamp socket (direct or alternating current) when those interested may see the enlarged pictures on the screen, showing in detail the article itself in elevation and cross section, inside and out, and how made from the raw material to the finished product.

The salesman tucks this little stereopticon with the slides in his grip, together with price-lists, thus enabling him to show and quote his prospective customer almost every article required in an iron, brass or steel foundry, including the buildings, laboratory, pattern shop, core room, core ovens, sand blast and over-head trolley installations, cupolas, blowers, linings, brass furnaces, tumbling barrels, sand sifters and mixers, ladles, magnet separators, hay rope making, bellows, riddles and brushes, also facing mills, forge, boiler and machine shops, etc.; the farms in Rhode Island, New York, New Jersey, Pennsylvania and Delaware, on which the sand, clay and core gravel originates, and some of the steam barges and tug boats that carry this commodity direct to the foundries to inside points along the rivers and canals and outside along the Atlantic Coast from New England States and South Ports to Philadelphia, Wilmington, Baltimore, Norfolk, etc. To those about to install new equipment this idea will be appreciated, as more can be learned in five minutes than could in a week otherwise. The Paxson Company produce the equipment and supplies, make the photos and slides and throw them on the screen, which they claim the new way to show goods; they are continually adding new slides to their collection.

RICHARDS SPECIFIC GRAVITY SCALE

The scale here shown is the invention of Joseph Richards, late superintendent of the Delaware Metal Refinery. Mr. Richards was one of the pioneers in the manufacture of solder on a large scale in America. The Richards specific gravity scale was devised for the purpose of affording a quick and accurate method for estimating the percentage of tin-lead and antimony up to 24 per cent. in solder. The scale furnishes the means for a quick

RICHARDS SOLDER SCALE.

mechanical test and is not intended to take the place of wet chemical analysis. It is claimed that any careful person, however, can with a little practice approximate within one-quarter of 1 per cent.. The scale is manufactured only by the Delaware Metal Refinery, Eighteenth street and Washington avenue, Philadelphia, Pa.

THE CRAWFORD OVEN

The duties required of ovens for baking various japans and lacquers, bluing screws, drying, etc., are widely divergent so far as temperatures desired are concerned. Two things, however, are universally sought; namely, economy of fuel and thorough insulation of oven. The Crawford Sectional Oven, manufactured by The Oven Equipment & Manufacturing Company, of New

Haven, Conn., has in its several types shown high insulation efficiency and marked fuel economy.

The heating unit of these ovens is the Enclosed Flame Gas Burner, adapted to burn city, natural, gasoline and producer gases. Air from a positive blower is forced into the burner, supplying oxygen in such amount as to effect perfect combustion of gas used as fuel. This feature permits of the utilization of every heat unit in the fuel and makes the Enclosed Flame Gas Burner one of the most economic means of converting the gases named into available heat units. The air under pressure after being highly heated in the burner is forced into the oven and there circulates rapidly to all parts. This gives an even temperature throughout, as is indicated by goods in the most remote corner of oven from burner baking in the same length of time, and just as perfectly as articles nearer the source of heat. The rapid circulation of this pre-heated air promptly removes fumes from surfaces that are japanned or lacquered and ejects them at the oven vents, thereby assuring uniformity of color and bright work. Moisture is also carried away in the same efficient manner. This feature of forced circulation is said to be exclusive with the Crawford Sectional Oven.

A HYDRO-PNEUMATIC ACCUMULATOR

Hydraulic presses for broaching, pressing, forging, riveting, shearing, bending, etc., are coming into more general use every day and many shops now have more than one hydraulic machine. Where such conditions exist, especially if the machines are large, a hydraulic accumulator becomes an important if not an indispensable part. Of course, pumps could be built to supply pressure directly, but the cost of such would be high and perhaps prohibitive.

One of the simplest and least expensive types of accumulators is that shown in Fig. 1, where removable suspended weights bear on a ram which is packed and free to move in a vertical cylinder filled with water. Weighted accumulators at their best are sometimes undesirable, especially on the upper floors, or in light buildings, where the shock caused by suddenly checking the descending weight is apt to cause damage or annoyance. They necessarily occupy considerable space and when built for large capacities become cumbersome.

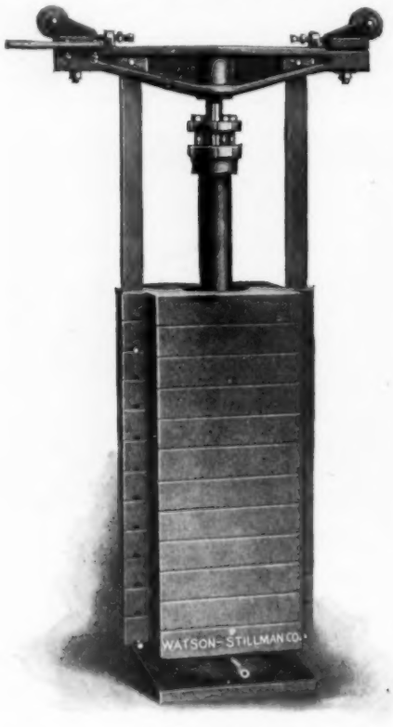


FIG. 1. WATSON-STILLMAN SIMPLE WEIGHTED ACCUMULATOR.

To contend with the conditions that make weighted accumulators undesirable, the Watson-Stillman Company, New York, have perfected hydro-pneumatic accumulator. The claims made by this company for their new accumulator are that it has no weights, it operates evenly and without shock, it occupies little space, it works unfailingly, and besides will do all that a weighted accumulator will do.

Where a large per cent. of the stroke of the hydraulic ram is made against low resistance or no resistance at all, and is then followed by the customary final squeeze under high pressure, a hydro-pneumatic accumulator made for both high and low pressure service is best. Where high pressure is desired continuously, the high pressure accumulator shown in Fig. 2 is most desirable. The above company manufactures both types.

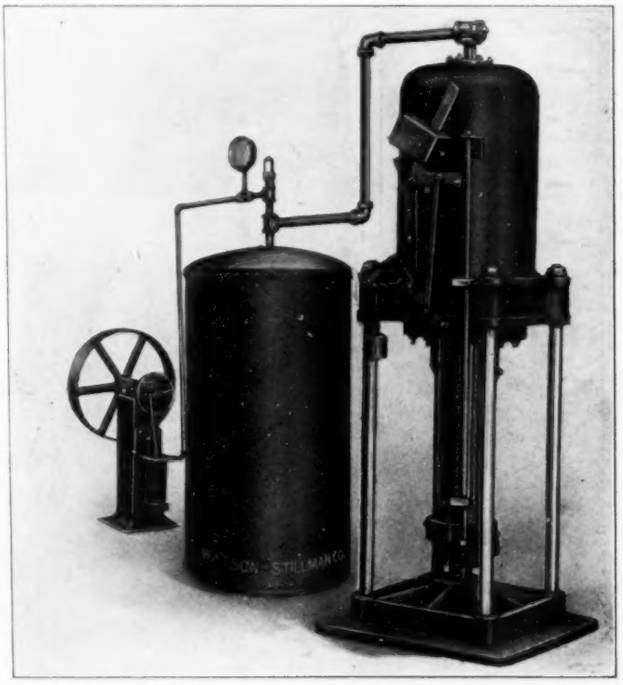


FIG. 2. THE WATSON-STILLMAN HYDRO-PNEUMATIC ACCUMULATOR.

TEST OF A MONARCH FURNACE

A test of a No. 275 Monarch, combustion chamber crucible tilting furnace, made recently, gave the following results:

Date.	Heat No.	Metal weight.	Fire started.	Metal poured.
Nov. 22.....	1	711	8:47	10:28
	2	711	10:37	11:55
	3	711	12:05	1:15
	4	711	1:23	2:35
	5	400	2:45	3:33

No.	Time to melt.	Casting loss.	Metal loss.	Oil consumed. Total.	Oil consumed. Per 100 lbs.
1	1:41	None	Not checked	19.76	2.78
2	1:18	None	Not checked	12.48	1.78
3	1:10	None	Not checked	11.18	1.57
4	1:12	None	Not checked	11.18	1.57
5	0:48	None	Not checked	8.06	2.01

Mixture: 90% copper, 7% tin, 3% zinc, trace lead.

NOTE.—The actual time from the lighting of the fire, at 8:47, until the final pot of metal was poured, at 3:33 p. m., was 6 hours 46 minutes. The actual melting time was 6 hours, 9 minutes, allowing 37 minutes for pouring and recharging furnace. This furnace is manufactured by the Monarch Engineering and Manufacturing Company, Baltimore, Md.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23rd street, New York, on the fourth Friday of each month, 8 p. m.

The fiftieth regular meeting of the association was held Friday, March 28, with 35 members present. Seven applications were acted upon and six active and one associate were added to the membership. A branch has been formed in Dayton, Ohio, and upon their application a charter was granted.

A party of members and friends attended the annual meeting of the American Electro-Chemical Society, held at Atlantic City, N. J., April 5, the principal feature of which was a symposium upon Electro-Plating; some of the members attended an open meeting of the Philadelphia branch, which was held on the evening of the fourth. During the meeting, among the subjects discussed were the cleansing of polished copper preparatory to gilding and plating, silver solutions and plating black finishes upon steel.

The March meeting of the Philadelphia branch was held March 28th, with President Clement in the chair. Mr. Arthur B. Wells was elected to the Supreme Executive Board.

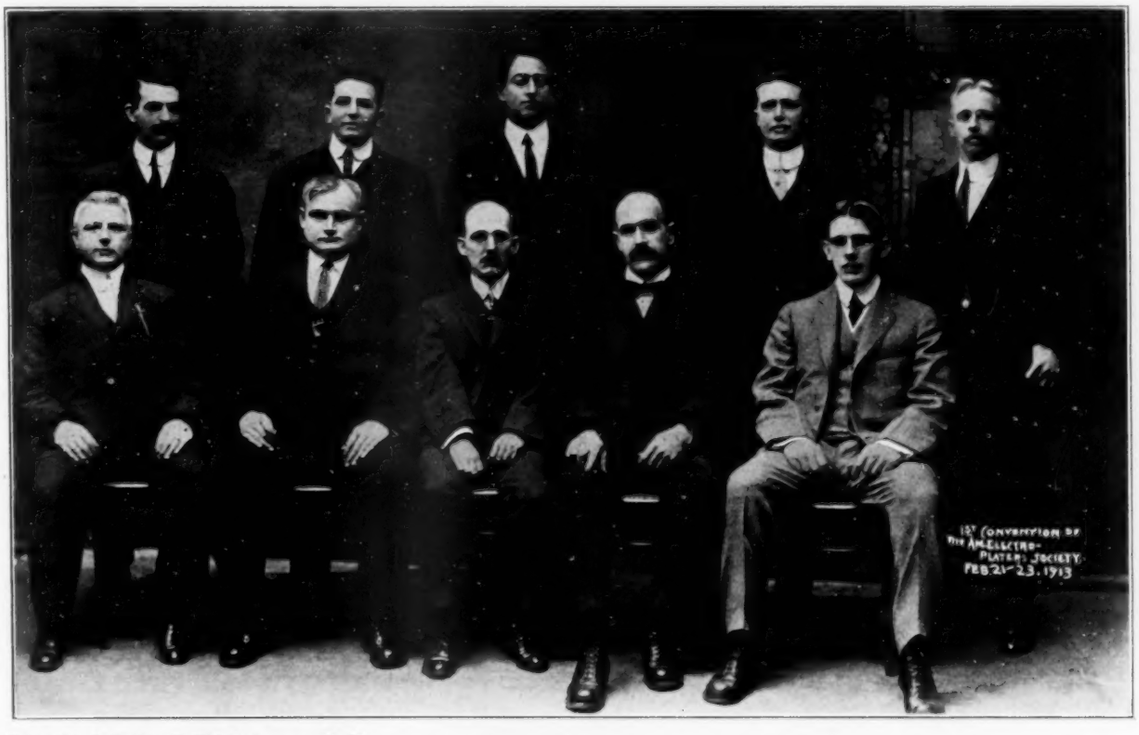


Photo by Sprinkle, 51 Third Avenue, N. Y.

DELEGATES TO THE FIRST ANNUAL CONVENTION OF THE NATIONAL ELECTRO-PLATERS' ASSOCIATION.

Left to right: Front Row—Charles H. Procter, founder, New York; J. H. Hansjosten, Chicago, Ill.; George B. Hogaboom, New York; W. S. Barrows, Toronto; John J. Schultz, Detroit, Mich. Back Row—W. W. Wells, Jr., Toronto; "Trisalyt Bill" Schneider, New York; L. E. Sturdevant, Binghamton, N. Y.; John E. Stirling, New York; W. S. Terpenny, Chicago, Ill.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

President, Theo. Anrens, Louisville, Ky.; Commissioner, William M. Webster. All correspondence should be addressed to the Commissioner, William M. Webster, 139 N. Clark street, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December.

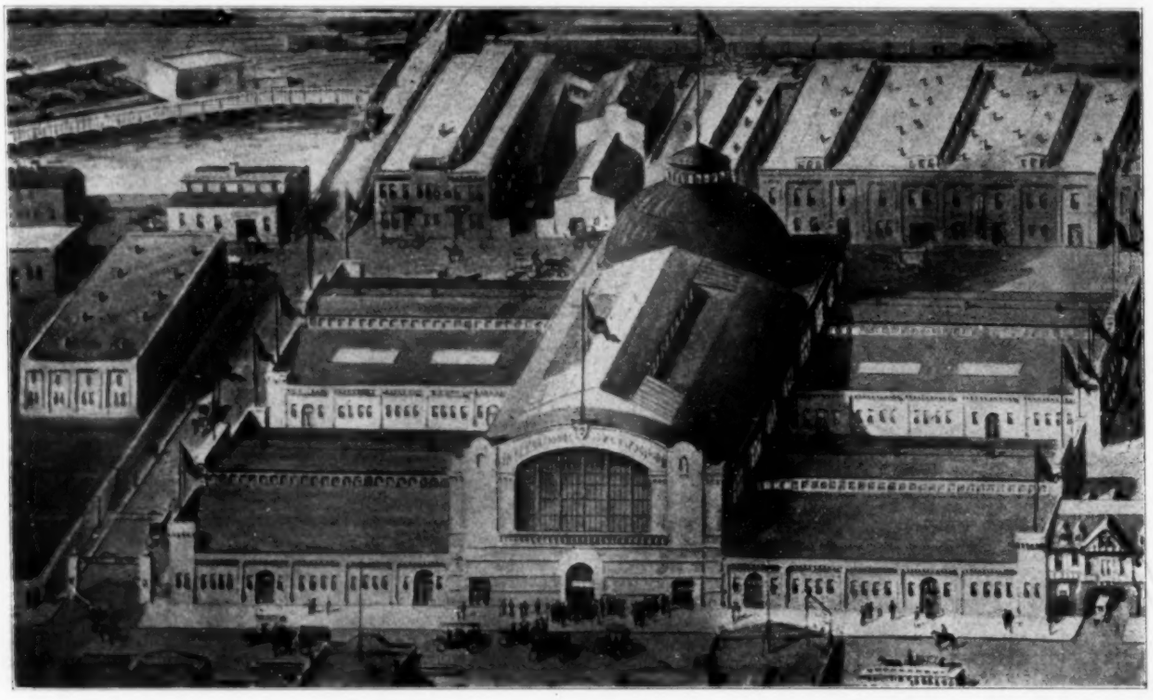
Commissioner Webster reports that this association held their Spring meeting at the Planters Hotel in St. Louis, Missouri., on Tuesday and Wednesday, March 18 and 19, and from point of attendance and what was accomplished, it has been the most successful Spring meeting held in many years. The Commissioner was instructed to compile and issue statistics showing the cost of lake copper and prices at which the various kinds of goods in the water brass goods line have been sold in the past twenty years. It tried out its second experiment of awarding

each member the sum of $10.00 for being present to answer all roll calls and in constant attendance at all sessions of all meetings, except when excused by the Chair, which has a very strengthening and beneficial effect. It took in several new members—appointed a Committee to devise ways and means to stop further loss and adjourned to meet in Cleveland, O., on June 10 and 11 this year.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, H. R. Atwater, Cleveland, Ohio; Secretary, C. E. Hoyt; Treasurer, J. S. McCormick, Pittsburgh, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association.

Secretary Hoyt states that he is pleased to announce to all former exhibitors that the 1913 Exhibit will be held in Chicago October 10 to 17, and that the Conventions of the allied Foundrymen's Associations will be held in Chicago the week beginning October 13. Formal announcements with more detailed information will be made later, but the same general conditions will prevail that have governed past shows. The great International Amphitheater, with more than two acres of floor space under cover, and unlimited yard space, has been leased. The accommodations are great, switching tracks run right into the two buildings and conditions are favorable for handling and operating the heaviest exhibits.



AMPHITHEATRE, CHICAGO, ILL., WHERE THE FOUNDRY MACHINE AND EXHIBITION COMPANY WILL HOLD ITS EXHIBITION IN CONNECTION WITH THE ALLIED FOUNDRYMEN'S CONVENTION, OCTOBER 10-17, 1913.

INSTITUTE OF METALS

President, Professor W. Gowland, F. R. S.; Treasurer, Professor Turner, M. Sc.; Secretary, G. Shaw Scott. All correspondence should be addressed to the Secretary, G. Shaw Scott, M. Sc., Institute of Metals, Caxton House, Westminster, S. W., London, England. The objects of the Institute are for the educational welfare of the metal industry.

The General Annual Meeting of the Institute was held in London, England, March 11-12, 1913. Following the election of officers, the following papers were presented: The Corrosion of Aluminum, The Microstructure of German Silver, Metal Filament Lamps, Contributions to the History of Corrosion, Part II, The Quantitative Effect of Rapid Cooling upon the Constitution of Binary Alloys, and a Report of Council.

THE RAILWAY ASSOCIATION

The Railway Business Association have issued Bulletin No. 12 under date of March 21, which is entitled the "National Menace of Railway Strikes." The pamphlet advocates the springing at the extra session of Congress of Federal Arbitration machinery and says that the country's bare escape recently from railway strikes tying up traffic throughout the land, in some instances nearly half the whole population, makes it imperative to remove at once the possibility of such a situation in the future.

The association further urges that the Erdman Act should be amended forthwith or legislation substituted for it providing a form of voluntary arbitration so little open to valid objection as to deprive disputants of all reasonable excuse for declining arbitration under the law. To postpone remedial legislation is to invite widespread and perhaps national disaster at any moment. The Bulletin ends with the following appeal to the President and Congress:

"To save all the people from the waste and the misery of strikes is so imperative that it would seem that the President and the leaders in Congress might well include in their legislative programme for the forthcoming extra session consideration of appropriate measures for the strengthening and improvement of the machinery for arbitration in railway labor controversies."

F. E. Irish is now connected with the Buckeye Products Company, of Cincinnati, Ohio, in the capacity of salesman of foundry supplies.

Guion Thompson, engineer, Waterbury, Conn., announces under date of March 31 that he is the successor of Thompson and MacPherson, Engineers.

G. E. Moreland, who has been with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., as foreman plater, has resigned and accepted a similar position with the California Industrial Company, of Los Angeles, Cal.

Fred C. Clement, president of the Philadelphia Branch of the American Electro-platers Society, is now connected with the Mechanical Department of the Bellevue-Stratford Hotel, of that city, as foreman plater. Mr. Clement was formerly with the John L. Gaumer Company, of Philadelphia.

J. W. Cocke, formerly connected with the Baltimore Tube Company, of Baltimore, Md., has accepted a position as salesman with the Rome Hollow Wire & Tube Company, Rome, N. Y. Mr. Cocke has now been out on the road for a long time and reports that business is good in his line.

W. H. Clerk, who has been foreman plater for the Harrell Manufacturing Company, of Newark, N. J., for thirty-four years, will have charge of this department for W. H. Clerk & Son, a new concern of Long Branch, N. J., which will engage in electroplating, steam and hot water heating and water supply systems.

John Hill, president and one of the organizers of the Hill & Griffith Company, manufacturers of and dealers in foundry supplies, Cincinnati, Ohio, has resigned and will take a much needed rest before making plans for the future. Mr. Hill and T. L. Griffith organized this company in 1895 and prior to that time Mr. Hill was connected with the S. Obermayer Company, also of Cincinnati, for thirteen years. E. T. Richards succeeds Mr. Hill as president of the Hill & Griffith Company.

DEATH

Sir William White, who died recently at his home in London, it will be remembered was the first president of the Institute of Metals, an institution in which Sir William took a great interest from the time of its formation until his death. Sir William White was known as the father of the modern battleship, and through a space of sixteen years, from 1885 until 1902, he designed two hundred and fifty warships. Among some of the more notable of the ships that he designed were those of the Charleston and Baltimore, which were purchased by the United States. At the age of fifty-seven Sir William retired from the government service, having been from 1885 a Director of Naval Construction and Assistant Controller of the Royal Navy. In 1904 he was able once more to resume active work as a consulting naval architect for the Cunard liner, "Mauretania."

Eugene Richard Eaton, aged 68 years, a well-known machinist of Columbus, Ohio, died at his home, 1287 Franklin avenue, recently.

Trade News
MAP OF THE WORLD
BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

April 1, 1913.

Business has been good hereabouts throughout the first quarter of the year, and April has begun without any change in conditions. All metal industries hereabouts are busy and, generally speaking, the outlook continues bright. What setback business will receive on account of the disastrous floods in the middle west, if any, is not yet estimated, but it is not unlikely that all industries will suffer somewhat before the year is out on account of these losses. It is not unlikely either that some branches of the metal industries will benefit on account of the damage to stocks, and the wreckage of property of all kinds.

Brass factories have all been busy steadily since the year began, and there is no overabundance of labor, while wages of unskilled laborers on outside work have been forced up steadily, owing to the demand for them in factories, a demand which has shown only a slight falling off with the approach of spring. Considerable building has been prosecuted throughout the winter, and is the American Brass Company's branch known as the Benedict & Burnham mill—there is a large tube mill being constructed. This company's fine new office building opposite the Union depot is rapidly assuming form, the masonry of the cellar and first story being complete at this writing. The power plant of the Waterbury Brass Company and the new addition of the E. J. Manville Company's plant on East Main street are two more notable factory additions on which work is being rushed. The Chase Rolling Mills Company tube mills in Waterville are nearly complete.

Waterbury is grieving over the recent sale of the stable of handsome Percheron horses owned by the Chase Company to Barnum & Bailey's circus. These handsome animals have been the most conspicuous part of every day traffic here for many years, and now they are no longer needed because of the opening of a new trolley railway for freight and passenger traffic from the New Haven road's tracks at the new Chase mill in Waterville to the Chase plants at the north end of the city.

Considerable of a sensation was caused among factory people by the arrest Saturday, March 29, of J. Emmett Hall, a young bookkeeper in the employ of the Scovill Manufacturing Company, on a charge of embezzlement, the total amount taken being estimated at about $3,000, although he was released on a $1,000 bond. In the police court Thursday, April 3, he was held for the Superior Court, waiving examination, and in the meantime his friends are hoping to secure his final release by making full restitution to the company, which has a record for clemency in such matters. Hall is but a short time married and the manner in which he was living, although earning but $18 a week, is said to have directed suspicion towards him. It is alleged that he covered up his tracks by the aid of an adding machine.—F. B. F.

PROVIDENCE, R. I.

April 1, 1913.

There has been a general apathy in the manufacturing jewelry business and the kindred and associated trades during the past month. In some lines of the metal trades, however, there has been a brisk business reported. The outlook is not so encouraging as many of the business men of the city would like to see, and much anxiety is manifested as to what the outcome of the tariff agitation is to be. Work in the various foundries is reported as being unusually good, while at the bronze foundry of the Gorham Manufacturing Company in Elmwood the orders continue to increase notwithstanding the department has work enough on hand to keep it running full time for two years without any additional orders being received.

The Vennerbeck & Clase Company, gold and silver platers, have recently installed a 20-inch crank press in their plant on Chestnut street. The press is from the Waterbury Farrell Foundry, of Waterbury, Conn.

The Brown & Sharpe Manufacturing Company has just installed a new Brown & Sharpe Universal milling machine in the manufacturing jewelry establishment of the J. H. Manning Company, Stewart street, which is expected to add considerably to the efficiency of the plant in the manufacturing of bracelets.

A three-story brick building, 164 feet in length and 60 feet in width, is to be erected at the corner of Broad street and Lexington avenue, this city, by the Silverman Brothers, manufacturing jewelers. It is to be of modern and attractive design, with all the latest improvements and equipped for any kind of a manufacturing business. The Silverman Brothers will occupy one floor, while the other two floors will be leased.

H. J. Astle & Company, of this city, has recently installed two large polishing systems of modern type at the manufacturing jewelry plant of the J. A. Rosenbaum Company, at Newark, N. J.

Articles of incorporation have been filed by Albert W. Holmes, Charles E. Holmes and David Davidson for a new jewelry concern, to be located in this city and with a capital of $200,000 operate as The Holmes Company. Authority is given the concern to manufacture and sell jewelry, and to deal in precious and semi-precious stones. Albert W. Holmes is president and treasurer; C. L. Carter is assistant treasurer, and George Hopps is vice-president and secretary.

At the annual meeting of the stockholders of the Gorham Manufacturing Company the entire board of directors was re-elected. Of the 50,000 shares of stock outstanding, 34,969 shares were voted personally by the owners and 9,373 shares were voted by proxies. Among other things the report of the treasurer showed that during the past year the company spent for labor $1,916,193; also that for silver bullion the sum of $1,798,197.50 had been expended. The board of directors consists of the following members: Edward Holbrook, Herbert J. Wells, John S. Holbrook, John F. P. Lawton, E. Frank Aldrich, Russell Grinnell, Fred C. Lawton, Henry S. Sprague and Frank W. Matteson. At the meeting of the directors held later the following officers were elected: Edward Holbrook, president and treasurer; vice-president, John S. Holbrook; secretary and assistant treasurer, John F. P. Lawton; assistant treasurer, William E. Keyes; superintendent, Fred C. Lawton.

William A. Copeland, treasurer of the Martin-Copeland Company, manufacturing jewelers, formerly president of the New England Manufacturing Jewelers' and Silversmiths' Association, died at his home, 155 Princeton avenue, this city, on March 14 following an illness of more than a year from a complication of diseases. He was in his sixty-fourth year. He was also interested in the Bassett Jewelry Company.

The moulding room of the Stillman-White Foundry Company, at the corner of Charles and Bark streets, was wrecked by the falling of a 40-foot chimney, which was blown down by the wind during a recent gale. Eleven men had left the room only five minutes before the crash, to get their lunch, and only this fact, it is believed, saved some of them from death.

Work has been commenced on the new building for the F. E. Newell Brass Foundry at Pawtucket. The building will be of brick, one part being two stories in height and the rest of one story. It will be 116 feet in length and 40 feet wide.—W. H. M.

ATTLEBORO, MASS.

April 1, 1913.

April opens with the jewelers waiting anxiously the new tariff. The jewelry imports are increasing, and those of the last week in February were 110 per cent. higher than the year previous. The only information that leaks from Washington is that Congressman Palmer, of Pennsylvania, is in charge of the metal schedule, and that Chairman Underwood and Congressman Shackleford are in charge of the sundries schedule, both of which affect the jewelry trade. As these three are known as "comparative conservatives," the jewelers are hopeful. Meanwhile, the last of the rush on samples is ending, the salesmen are starting out and the jewelers at home are turning their attention to the big convention of jobbers in Providence this month. The mail orders in March were, for many firms, above the average.

The A. Bushee Company announces that it is to drop its collar button line in June. O. W. Clifford, of the G. K. Webster Company, of North Attleboro, is one of the Boston Chamber of Commerce tourists who are studying the business opportunities of South America. F. L. Aeschliman, on April 1, moved his business to his new quarters in the Hayward building. Miss Sarah R. Hurley has been granted a patent on a machine for making soldered rope chain. She is a well-known North Attleboro rope maker.—C. C. C.

NEWARK, N. J.

Newark, N. J., April 1, 1913.

William F. Koehler and Louis Greget, who were with Jeanot and Shiebler of Brooklyn, have opened a plant at 15 Ward street, to manufacture 14 and 18-karat gold and platinum watch cases. They are making a specialty of bracelet watches and high-grade bracelets. The Elite Novelty Company moved their plant from Winsted, Conn., to the Shiman-Miller building, this city. They make a line of metal novelties, jewelry cases, etc., of gold and silver-plated and other finishes. They have established a very good plant, and have a large force working. Jacob Katz, of 416 Broadway, New York City, is the proprietor, and that is the sales office.

George W. Heath and Company moved from New York City to Newark and built a two-story factory at 208 First street, to make gold fountain pens and gold and silver pencils. The plant cost $16,000 and has electric power. Fifty hands are employed on the job. J. R. Wood & Sons, of Maiden Lane, New York City, bought the plant of the Pennsylvania Watch Case Company at York, Pa., and moved it to this city, in the Rosenbaum building, at Broad and Astor streets. They make gold filled watch cases, and have the third floor. The factory is in charge of Mr. Bennett.

The Newark Art Foundry, of 30 Franklin street, have been doing gold, silver and bronze casting business, and have also taken up the manufacture of gold, silver and bronze statues and novelties. Ernest Vatier, the manager, used to be with the Cupror Company. The firm are talking of taking the entire building or building a new factory. Mr. Vatier has a new metal to be put on the market, which is an imitation of gold. Have three salesmen out—George S. May, Mr. Moranard and Emil Schleiger.

DETROIT, MICHIGAN

April 1, 1913.

At the close of another month Detroit brass and aluminum manufacturers find themselves again face to face with bright conditions for increased business. Added to this, labor and transportation conditions are in fine shape and the outlook for the next few months, at least, could not be better. At the same time every automobile factory in the city is running at its fullest capacity. Producers of plumbers' and other supplies made of brass, aluminum or copper have nothing but encouraging words for the future. Many manufacturers expect to feel eventually the results that may follow the floods and cyclones that occurred in different parts of the west during the last month. Much building may result and such conditions, of course, make

a demand for plumbers' supplies and builders' hardware. The Ford Motor company is planning extensions at its big factory in Highland Park, and when the work is completed a large increase in employes will be made. This plant is now giving work to about fourteen thousand men.

Fire of an unknown origin caused eleven thousand dollars damage to the plant of the Aluminum Castings company recently. The molding plant and the sand sheds were destroyed. The fire started about six o'clock on Sunday morning and proved so stubborn that three alarms were turned in, bringing out about all the apparatus in that part of the city. The buildings were only temporary affairs and were soon to be replaced with structures of cement. The fire did not affect to any extent the operations of the plant.—F. J. H.

INDUSTRIAL CITIES FLOOD

COLUMBUS, Ohio, March 29, 1913.

Untold damage was done to the metal industry of Columbus and central Ohio by the unprecedented floods which swept the Buckeye State the latter part of March. The waters were higher than ever was known in Columbus, Zanesville, Newark, Dayton, Chillicothe, Kenton, Marion, Delaware, Xenia, Hamilton and many other points. While it is yet too early to give a very close estimate of the injury done, still it is believed the damages to property in general will be $300,000,000, much of which will fall on the metal industry.

Many of the manufacturing plants where metal forms a large part of their output are located in Columbus, Dayton and Hamilton. Another fact is that most of the factories are located near the river for obvious reasons. These were practically all flooded and damages amounting into the millions of dollars was done. In Columbus alone several dozen plants were put out of commission, and the water has not yet subsided to permit the owners to estimate the damage attending on the high waters. The John W. Brown Manufacturing Company, makers of automobile lamps, sustained a heavy damage, as did the Ohio Metal Company, dealers in metals of all kinds. Henry Loeb, of the latter, says the damage was big, but he will be ready to transact business at the old stand within a week.

The Lowe Brothers Machine Works at 200 West Mound street; The Jaeger Machine Company, at 216 West Rich street; Smith & Williams, at 170 West State street; The Tippett Manufacturing Company, at 172 West Locust street, and a number of others, sustained damages. In addition to the injury sustained by the flood directly, there will also be quite a loss resulting from the cessation of business. Bridges and roads in every part of Central Ohio were washed away and it will require weeks before industrial conditions are again normal. On the whole the flood was the worst that ever visited the Buckeye State. In Dayton dozens of metal manufacturing companies were flooded, and the damages will be high. The same is true of Hamilton, where the high waters were possibly the worst.

The plant of the National Cash Register Company in Dayton was not flooded as it stood on the high grounds from the central part of the city. In fact, the plant was used as a relief station to care for the refugees. President Patterson, of the company, did noble service in that capacity.

Under date of March 27, John H. Patterson, president of the National Cash Register Company, said in reply to a telegram from the New York *Times*:

DAYTON'S BUSINESS STREET NEAR THE PLANT OF THE NATIONAL CASH REGISTER COMPANY.

By Telegraph to the Editor of the New York *Times*.

"Answering your telegram of inquiry, the situation here is desperate. All of the people, except those on the outskirts, are imprisoned by water. They have had no food, no drinking water, no lights and no heat for two days. We have had no house-to-house communication by telephone for two days. The Dayton waterworks stopped two days ago.

"Fire has now been raging for twenty-four hours in the center of the city and at this time is spreading. The Beckel Hotel has been burned. The weather has turned suddenly cold, with strong

wind and snow. The water current is too strong for rowboats and rafts.

"We need help and hope that it can reach us today from nearby cities. The help should be in the form of motor boats and people to man them. We also need good rowboats. We need troops for protection and help. We need fire engines, motor trucks and automobiles—also provisions, clothing and medical supplies.

"Our factory (the National Cash Register Company's) is safe. It has its own power, heat, electricity and water plant. We and private houses are caring for many people, but they are only a small proportion of the sufferers. We cannot reach the central, northeastern, northern, or western parts of the city; consequently we cannot answer many telegrams of inquiry that are coming to us about the safety of people.

"The railroads reaching Dayton are practically all out of service. JOHN H. PATTERSON,

"President of the National Cash Register Company and Chairman of the Dayton Citizens' Relief Committee."

The plant of the American Cash Register Company, located on West Broad street, Columbus, Ohio, was flooded and a great amount of damage was done. For a time the plant was used as a relief station. The metal industry, even when the flood is taken out of consideration, has been slow in many ways. The demand has not been the best and prices have been rather weak, generally speaking.—J. W. L.

WILKES-BARRE, PA.

APRIL 1, 1913.

Royer & Zueibel, brass founders, are going to manufacture a screen to separate the sizes of sand. It will be made of wire nails on a belt, the saw passing over, the capacity being limited to the speed that it is run at. A continuous stream of sand can be run through it, ten inches wide and one half inch thick. This sand is for foundry purposes. Will also make a coal and copper mine safety device, for overwinding mine cages. It is an insurance against life and pays for itself. Have sold 125 of these for coal mines.

This firm is also putting on the market a 90 per cent. metal packing, which is far superior to fibrous packings, as they lack wearing and heat resisting qualities. It is sold in loose form, in coils or rings and several railroads have adopted it. A company has been organized to put this packing on the market, called the Roybel Packing Company, 30 Church street, New York, the packing to be made here at the local plant. H. S. Hayward, Jr., at New York, is president and general manager; Mr. Lyle, secretary and treasurer. Royer and Zueibel will also manufacture metal universal packed ball joints of brass.—H. S.

LOUISVILLE, KENTUCKY

APRIL 1, 1913.

Considering the generally disturbed condition of business throughout the Ohio valley, the metal industry in Kentucky with its various branches is doing excellently. Inconvenience and interruption, more than direct pecuniary loss, were the penalties imposed by the phenomenal weather conditions late in March upon business in this section, and the copper, brass, plumbing supply, brazing and foundry trades appear to have suffered little if any serious effect, with prospects of a busy spring ahead. In the plumbing supply trade particularly it is expected that trade will improve with more settled weather, which is promised for April and May. Building has been slow in developing during March, and property improvement of all sorts has been almost at a standstill, but work which is definitely planned forecasts with little doubt that the summer of 1913 will produce even greater activity than that of 1912 or 1911, and correspondingly inflated orders from the plumbers are ahead, although it may have been delayed somewhat by unfavorable natural conditions.

Trade in manufactured metal products is up to standard for this time of the year. The Kentucky distilling trade is providing only fair business for the coppersmiths, inasmuch as the end of the active operating season of 1912-13 is drawing near, and the plant owners are disposed to run through with present facilities and as few changes in equipment as are possible. The effect of the new Webb anti-shipping law, by which the government forbids the shipment of liquor anywhere from "wet" into "dry" spots, is depressing, as most of the large and established plants in this section are living within the letter of the law and are regulating the shipment of their output accordingly, with the result that scant possibility for demand which will increase the capacities of many distilleries is evident until the favorable legislation which the whisky men confidently expect will do away with prohibited districts has time to develop.

The plant of Matt Corcoran & Co., 118 South Fifth street, Louisville, has been completely renovated during the past month and is now in tip-top shape for spring business. Assording to Matt Corcoran, senior member of the firm, trade in copper coils and other metal equipment for tanneries in this section is opening briskly, indicating a rejuvenation of business in the local branch of an industry which has not been at its best in this section for several years. Half a dozen big Louisville tanneries are not only prospering at present, but are making arrangements to handle a bigger volume of hides than ever before in their history, and the Corcoran firm, which specializes in tannery outfits, is in possession of exceptionally bright prospects.

After nearly a half century's service with the Ahrens & Ott Manufacturing Company, of Louisville, one of the biggest plumbing supply concerns in the entire South, Albin Wunderlich, a leading Louisville citizen, has resigned the active duties of secretary of that company, although he will retain his interest in the concern. Mr. Wunderlich has grown with the well-known Main street supply house, taking vital interest in its affairs and becoming the right-hand man of President Theodore Ahrens. His retirement from active business was received with regret but with best wishes for hale and hearty existence as a retired business man. A dinner at the Seelbach Hotel was tendered Mr. Wunderlich by President Ahrens and the executive staff of the company when the announcement of the change was made, and at the close of the affair a beautiful gold watch was presented to the guest of honor. Henry Wunderlich, a son of Albin Wunderlich, who has been connected with the Ahrens & Ott Manufacturing Company for ten years past, will assume his father's duties.

Samuel H. Moon, general manager of the Ahrens & Ott Manufacturing Company, of Louisville, has relinquished direct supervision of the Louisville branch of the company and will exercise generally executive functions henceforward. J. W. Oliver, who has assisted Mr. Moon for several years, in superintending the local interests of the concern, has been appointed headquarters manager. The change has gone into effect and Mr. Oliver is filling his new and higher position admirably.

Henry M. Reed, for some time past manager of the Louisville plant and offices of the Standard Sanitary Manufacturing Company, of Pittsburgh, and a well-known member of the plumbing supply trade, has received a fine promotion in appointment to the position of assistant general manager of the Standard interests, with headquarters in Pittsburgh. During his first trip out in exercising general supervision over the various Standard plants, Mr. Reed was marooned in Indianapolis, Ind., during the terrific rain and wind storms which swept Indiana and Ohio, causing the Dayton disaster. While in Richmond, Ind., en route to Pittsburgh, the Standard assistant manager was overtaken by the flood and made port in Indianapolis just in time to be tied up for several days beyond all communication by rail or wire, when the Hoosier capital suffered serious loss in the inundation of West Indianapolis.

The American Brass & Metal Works, of Louisville, formerly the Houser Manufacturing Company, is doing big business in brass dental supplies. The development of this trade in Louisville has been unusually large during the past several months, one important new depot, the Louisville Dental Laboratory, having been established in addition to several other similar concerns patronizing the well-known plant at Clay and Jefferson streets. William Houser, president of the American Brass & Metal Works, is also interested in the movement which has been placed afoot to establish a dental clinic to examine the teeth of children in Louisville's public schools. This educational feature should result in the rising generation demanding better dental work, accordingly stimulating the demand for dental supplies of all sorts.—S. D. C., Jr.

THE TRADE JOURNAL*

By G. D. Crain, Jr.

A song which was heard at a recent meeting of the Rotary Club was: "We're here because we're here." Some of the business men of this country once believed that the trade journals had no better excuse for existence than that. But the trade and technical paper has proven its usefulness, and it is here to stay. Instead of being merely tolerated, it is now being welcomed and made use of.

What is a trade journal? It is a paper which is made to interest but one class of readers. Technical papers, such as those for architects, engineers, machinery men, etc., are usually included in the same class, though sometimes the distinction is made that trade journals are for those engaged in the distribution of a given class of goods, while technical papers cater to classes which consume certain products. For example, the Clothier & Furnisher is distinctly a trade journal, while Engineering News would be classified in the technical field. I believe I am safe in saying that the dominating idea of the present, as far as the commercial world is concerned, is greater efficiency. The problem of doing the thing better, or more quickly, or more cheaply, has been studied at every point, from the factory to the consumer; and the science of management has been evolved from a consideration of the details going into the production of goods or sales in the best possible way.

The Trade Journal, as I see it, has been more responsible than any other one thing for the increased efficiency of the modern business man.

This is, of course, a broad statement, and yet I believe consideration of the facts will demonstrate its truth. In the first place, it has provided a medium for the discussion of new ideas; and in the second it has developed a lot of them of its own initiative. Whenever a new plan for improving methods of production or management is evolved, the best place to get a clear, complete and authoritative statement of it is in the pages of the trade journals covering the fields affected. It will be there—you can count on that. And on the other hand, whenever anybody discovers that he has a better system of cost accounting or a better method of handling material than has been used in his line previously, he is pretty likely to tell the trade journals about it sooner or later, directly or indirectly.

And this leads me to remark upon a peculiar and interesting coincidence, and that is that the live wires of every business are invariably the men who read their trade journals most closely. I do not say that they are live wires because they read trade journals; it may be a cause instead of an effect. But at any rate it is certainly significant that the men who are making the biggest successes are those who are giving close attention to the business papers in their respective fields, and are using them in a way calculated to get out of them all the value that they possess.

The trade journal idea is a good deal like the basic principle back of the Rotary Club, as I understand it. It is the thought of everybody helping everybody else. In the Rotary Club men come together for exchange of ideas and mutual benefit, everybody profiting.

In the trade journal, when an ideal condition is realized, as it frequently is, members of the business pool their experiences, the sum total being definite and established facts that can be relied upon to help everybody in the business. If the trade journal is in the news class, perhaps giving members of the trade in which it is interested timely information on the movement of the leading commodities, it has correspondents located in the principal cities, and these furnish a complete and reliable story of the developments of the market up to within a few hours of going to press. Many of these great journals maintain branch offices in the leading centers, with salaried managers and staffs. A company which publishes several papers in the men's wear field has large offices in New York and Chicago, keeps a Chicago printing plant working on its papers about all the time, and in addition prints two daily papers in New York. Big organizations like this cost a lot of money. One of the leading trade journals in Chicago spends $4,000 a week, outside of the actual cost of printing, this including a staff of seventy-five correspondents, eight or ten editorial writers in the main office, and a big road staff used in advertising and special work. But the papers of this kind are producing something distinctly worth while.

Most of you would be astonished to learn how many trade and technical papers there are. A recent compiler gave the number as 738. This does not include farm, law and medical journals, which belong in the several category of class publications. It is an interesting fact that the past ten years have been marked by a great increase in the number and a great improvement in the quality of trade and technical journals of all kinds. The trade paper of the old school, printed originally as a means of conveying market information, did little more than this, filling up a good many pages with polite personals about the various members of the trade. Likewise, such a paper attempted to cover the entire industry, from the origin of the raw material to the consumer. The effect was superficial, disjointed and uncertain.

The typical trade journal of today is radically different. It is chiefly educational in character, and smacks more of the magazine than the newspaper, although in many lines the market or news feature will always be predominant.

It likewise selects, as a rule, but one class of trade or one section of the country, and cultivates that field intensively, rather than extensively. Thus many papers are made for the manufacturer only, or for the retailer only. Many circulate altogether in the Middle West; others take the South, while there are, of course, many which cover the national field, from a standpoint of circulation. But whatever its plan of production, the twentieth century trade journal has a service to perform, and it performs it. It has something of value to say to its readers, and it usually says it in an interesting and convincing manner. It has the intimate touch, the familiar tone, the vocabulary and the ideas of the man in the business it reaches; it is by, for and of that business, and consequently it has a value that no merely general publication could ever hope to have.

This, incidentally, makes a trade journal, reaching a carefully selected class, a remarkably productive advertising medium. When the average person thinks of advertising, it is in connection with the newspapers or magazines, which are what the experts call consumer publications. Consequently the big national advertising campaigns, which are intended to make the name and characteristics of a product known to the general public, are featured in periodicals of that character. But it is a fact that some of the largest and most successful advertising campaigns on record have been conducted almost altogether in the trade publications. The public generally never hears of them, and it is not intended that it should. But they are getting results of a definite, measurable character.

The General Electric Co., which is known as a great national advertiser, is carrying the battle for business into every manufacturing paper of consequence, applying its *sales arguments definitely to the products covered by the several publications*; the result being that when a brick manufacturer picks up his trade journal, he sees an "ad." telling about what General Electric Motors have done in brick plants; the woodworker or furniture manufacturer hears of them with relation to that use only; textile operators are talked to with reference to their special requirements, and so on. Each argument has an inside aspect which gives it tremendous force.

I believe that the advertising of the future will be largely confined to just such carefully selected mediums. I do not mean to say that the general magazines will cease to exist; but that there will be fewer of them, and that they will carry less advertising, as the manufacturer finds that he can get the same results at a smaller cost by using the trade journal for distribution and the newspaper for local sales work, with the technical papers forming the link between the producer and the consumer of products which are not distributed generally, such as machinery.

If I were to be permitted to make one plea on behalf of the trade paper, it is this: Use it. The journal that is published for a special class can not accomplish its purpose unless it numbers among its readers a fair percentage of those in that class. And merely subscribing to such a paper does not end the job. It should be read carefully, from kiver to kiver, as the old darky said, including the advertising. No one can do this without benefiting; and the benefit will be measured exactly by the amount of interest put into the study.

*An address delivered before the Louisville Rotary Club, February 10, 1913.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The American Tube Works, Boston, Mass., are erecting a one-story addition to their foundry, 67 by 176 feet.

It is said that the new Stevens-Duryea automobile is the first car to have a body of aluminum throughout.

The Rome Manufacturing Company, Rome, N. Y., is building an extension to its tube mill, one story, 70 by 170 feet.

The Goshen Art Metalizing Company, metalizers of plaster of Paris figures and statuary, has been organized at Goshen, Ind.

The A. H. Wells Company, manufacturers of brass tubing, Waterbury, Conn., will build a one-story addition to its works, 26 by 51 feet.

The Allentown Brass & Hardware Company is a new concern which has recently been incorporated at Allentown, Pa., with a capital of $20,000.

Lamarre & Cie, St. Remi, Quebec, Canada, platers and polishers of stove trimmings and castings, are going to improve their nickel plating plant.

The Falcon Bronze Company, Youngstown, Ohio, are erecting an addition to their foundry, 40 by 100 feet, and will install some new equipment.

The Tacoma Plating and Repair Company has been organized at Tacoma, Wash., by J. B. Brady and Frank O. Bennett, to do a general plating business.

The Vulcan Manufacturing Company has purchased a plant at Painesville, Ohio, and will remodel it for the manufacture of popular-priced automobiles.

In order to increase their facilities, the National Brass Company, Grand Rapids, Mich., have bought a site and will build a two-story factory 73 by 126 feet.

The Bristol Company, manufacturers of recording instruments, Waterbury, Conn., will erect an additional factory building 52 by 160 feet, three stories.

The Aluminum Castings Company, Cleveland, Ohio, are planning to erect a large plant in the Central West, but are not prepared to give details at the present time.

The Syracuse Smelting Works, Brooklyn, N. Y., manufacturers of the Stanley process babbitt and white metals, are completing an addition to their plant on Jewell street.

The Imperial Metal Manufacturing Company have removed from Manhattan to Sunswick and Payntar avenues, Long Island City, N. Y. Over 100 hands are employed by this firm.

The Norton Company, manufacturers of abrasives and polishing and grinding wheels, are erecting an addition to their plant at Niagara Falls, N. Y., at an estimated cost of $20,000.

The Pioneer Brass Works, Indianapolis, Ind., through H. D. Kramm, secretary and treasurer, state that they have let the contract for an addition to foundry and machine shop to cost $7,500.

The Gray & Davis Company, manufacturers of automobile lamps and self-starters, Boston, Mass., are erecting a five-story, reinforced concrete factory, which will be fire-proof throughout.

The Newell Brass Foundry, Central Falls, R. I., are building a new brass foundry and finishing shop. Fred E. Newell states that this foundry has been in the possession of his family since 1845.

The Heintz Art Metal Company, Buffalo, N. Y., deny the report that they were considering the establishment of a Canadian plant. This company has a metal working shop and plating room.

The Old Colony Foundry Company, manufacturers of brass and iron castings, East Bridgewater, Mass., are about to erect an addition to their plant. They state that all materials have been purchased.

The De Vilbiss Manufacturing Company, manufacturers of spraying devices, Cleveland, Ohio, have had plans prepared for a new plant, construction of which will not, however, be begun until 1914.

The French Manufacturing Company, manufacturers of brass and copper tubing, is having plans prepared for a 40 by 110-foot addition to its plant. In addition to its tube mill this company also has a plating room.

The officers of the Park City Silverware Manufacturing Company, manufacturers of Novelties, Bridgeport, which was recently incorporated, are: President, Otto Ventulett, secretary-treasurer, John Ventulett.

The Hoover Steel Ball Company has purchased the steel ball department of the Flanders Manufacturing Company, of Chelsea, Mich. This department will be moved to Ann Arbor, Mich., where the plant of the Hoover Company is located.

The controlling interest in the Aluminum Foundry Company, Sebring, Ohio, has been purchased by A. C. Heacock and James H. Hotchkiss. The capacity of their plant for the manufacture of aluminum castings and kitchenware will be increased.

The Meaker Company, manufacturers of galvanized equipment, Chicago, Ill., is now operating twenty-four hours a day. The present business in the manufacture and installation of galvanizing equipment is said to be nearly double that of 1912.

Charles Forschner & Sons, Inc., manufacturers of scales, New Britain, Conn., have recently been incorporated for $25,000. The officers are: President, Charles F. Smith; vice-president, F. A. Searle; treasurer, A. G. Kimball; secretary, M. A. Parsons.

The Maiwurm Aluminum Works, Erie, Pa., was bought at a recent receivers' sale by a new company, incorporated with a capital stock of $25,000, under the name of the Sterling Aluminum Company. This company is manufacturing aluminum kitchen utensils.

The Electrolytic Art Metal Company, Trenton, N. J., is being reorganized for the manufacture of silver deposit ware and has elected the following officers: F. Crane, president; Stanley Wilcox, vice-president and general manager; F. R. Brace, secretary and counsel.

Paul Lux, of the Lux Model Works, Waterbury, Conn., has resigned his position as model maker of the Waterbury Clock Company, so that he may devote his entire time to the perfection of his line of special clock movements, spring motors and other small gear mechanisms.

The Crum-Wiley Manufacturing Company, manufacturers of brassware, are moving from Decatur, Ill., to Peru, in the same State. The company has been reorganized with a capital stock of $50,000, and the erection of a new plant is under way.

The officers of the new company are: President, F. L. Crum; vice-president, Max Kraus; secretary-treasurer, S. A. Shesler.

The Bennett-O'Connell Company, 3600 South Morgan street, Chicago, Ill., reports that the number of inquiries that they are receiving for their new Excel-All plating barrel is far beyond their expectations, and that this new machine is meeting with a very favorable reception.

The Jonathan Bartley Crucible Company, Trenton, N. J., have completed the erection of a new kiln and the installation of new machinery which doubles their capacity and will enable them to make shipments even more promptly than usual. Their usual practice is to ship orders the same day they are received.

Henry Orme's Sons, brass and iron founders, St. Paul, Minn., are planning a 70 by 100 foot extension to their foundry. They have recently purchased a 50-horsepower motor, two air compressors, five molding machines and two air hoists, and a Fisher furnace for melting brass. Two more air hoists will be required.

The Indianapolis Copper Company, manufacturers of copper and brass kettles, coils, etc., Indianapolis, Ind., is a new concern which has only been in operation since February 1. The officers of the company are: H. S. Steinbauer, president; J. J. Steinbauer, vice-president; R. G. Dungan, secretary-treasurer and manager.

The Leipsic Manufacturing Company, manufacturers of brass and aluminum goods, Leipsic, Ohio, notice of whose incorporation was published in the March issue of THE METAL INDUSTRY, announce the following officers: Ashley J. Huffman, president; Thomas H. Bower, secretary; A. A. Slaybaugh, treasurer; A. Steinhauer, manager.

The P. Pryibil Machine Company, Inc., manufacturers of metal and wood working machinery, New York, announce the personnel of their company to be as follows: Albert Pryibil, president and treasurer; Paul S. Pryibil, vice-president; Charles R. Bauerdorf, secretary; N. H. Dette, manager; Henry Fisher, superintendent; Fred Stendt, foreman.

The Stamford German Silver Company, makers of German silver in sheets, rods and wire, Stamford, Conn.. have completed their buildings and the machinery is being installed. The casting shop is in working order and nickel anodes are being made. It is hoped to get the rolling mill in shape to start the manufacture of German silver by the first of May.

The Aluminum Goods Mfg. Company are contemplating the erection of an addition to their plant at Two Rivers, Wis., three stories, 225 by 40 feet, fireproof construction. Also will build another addition to their Manitowoc, Wis., plant, three stories, 170 by 40 feet, for general manufacturing purposes. Both of these additions are to be up before the end of the year.

R. B. Seidel, Inc., 1322 Callowhill street, Philadelphia, Pa., whose crucibles have long been known among the brass foundries, reports that business is exceedingly good this spring. In fact, it has become necessary to build an addition to their factory in order to take care of the increase in business. This firm manufactures crucibles, retorts, stoppers, etc., for all general and special purposes.

The American Society of Plumbing Inspectors and Sanitary Engineers will hold its annual meeting in Louisville, Ky., on May 20, 21 and 22. The officers of the Society are now actively engaged in making arrangements for the meeting, and in the preparation of a program, which will include a number of topics to members of the trade and the metal working field generally.

The Union Brass & Metal Manufacturing Company, manufacturers of plumbers' brass goods and specialties, St. Paul, Minn., are erecting a foundry building 70 by 120 feet, one story; also an addition to their main building 50 by 100 feet, two stories. They expect to occupy these buildings by the first of June, which will double their capacity. They have a brass foundry, metal working shop and plating room.

The Cleveland Galvanizing Works Company, Cleveland, Ohio, announce that they have established a New York office at 253 Broadway, in charge of Mr. Thos. A. Troy. A limited stock of Samson and Bull Dog chains, white metal and brass pattern letters and figures, wood and leather fillets and brass dowels will be carried to provide for special orders. Stock orders will be shipped direct from the factory as heretofore.

John Hill, of Cincinnati, Ohio, has severed his connection with the Hill & Griffith Company of that city, manufacturers of foundry supplies, and has organized the John Hill Company to engage in the same line. The foundry of this company is now about ready for operations. Mr. Hill has been in the foundry supply business for twenty-five years, and for the last fifteen years has been president of the Hill & Griffith Company.

The American Pin Company has awarded contracts for additions to its plant at Waterville, Conn. The plans provide for a boiler house, 44 by 100 feet, of brick; a pump house, 16 by 24 feet, of brick and reinforced concrete; coal bunkers, 42 by 88 feet, of concrete; a concrete foundation for a radial stack, 20 by 21 feet, and a concrete pit for oil tanks, 12 by 40 feet. The New England Engineering Company is in charge of the engineering work.

The New Era Lustre Company, New Haven, Conn., announces that to meet the growth of the firm's business since its recent reorganization, ground has been broken for a new large factory building to be located at Wallington, N. J. This building will be equipped with appliances for making lacquers in the most modern manner, under the supervision of capable chemists, insuring absolute uniformity at all times. Branch supply houses will be maintained from which the trade will be supplied direct, instead of through the jobber, giving the customer the benefit. The new factory will have a capacity of 5,000 gallons per day, and will be able to take care of the largest consumer, as well as the smallest. Porcelain lined settling tanks, automatic mixers, everything of a mechanical nature that will assist in maintaining uniformity of product, will be installed, and inspection will be invited when finished.

The Wisconsin Aluminum Foundry Company, Manitowoc, Wis., have decided not to move their plant from that city, but will instead erect a $20,000 factory plant. The first building will be 100 by 200 feet, brick and steel, and will be the most modern aluminum foundry in the country, with the best equipment and a capacity of from ten to twelve tons of aluminum per day. The company have discontinued their brass line, and their work hereafter will be confined chiefly to aluminum crank cases. To provide funds for the new improvements the capital stock has been increased from $35,000 to $110,000, this making the second increase within a year. The present plant of the company, 110 by 52 feet, was found to be entirely inadequate, and over 100 men will be employed in the new factory. The officers of the company are: Henry Stahl, president; David Balkansky, vice-president; Bruno Dalwig, secretary-treasurer, and Abraham Schwartz, manager.

The American Manganese Bronze Company, Holmesburg, Pa., W. A. Locke, president, has been awarded contract No. 84, New York Board of Water Supply, for manganese bronze shaft caps for Catskill Aqueduct. These caps or tees are to be used on the top end of risers from the 14-foot tunnel now being driven under New York City to distribute the water through the street mains. These castings mark a departure in water works practice in line with the policy of making the permanent construction on this great work last indefinitely.

Contract 84 covers twenty-five distributing caps in the form of a tee with 48-inch diameter bottom inlet with two 30-inch diameter outlet and a removable cap, weighing over 10,000 pounds each and six caps with 72-inch bottom inlet and two 48-inch outlets weighing over 25,000 pounds each; the latter being the largest manganese bronze castings, other than propeller wheels, ever designed.

NEW RESEARCH LABORATORY

The new laboratories of The H. M. Lane Company, Detroit, Mich., were formally opened by a reception to the Detroit Foun-

drymen on Saturday evening, March 22, which was attended by about one hundred people. These laboratories are the outcome of the research work which has been carried on by H. M. Lane during the past dozen years. They are located at 18 East Piquette avenue, Detroit, Mich., and occupy some 5,000 square feet of floor space. The objects of the laboratory are:

To study core sands and core binders, so as to find the best mixture for the conditions present in different plants.

To study new core binders in order to ascertain their exact value to the foundry.

To determine the best method of mixing sands and binders for different classes of cores or molds.

A careful study is also made of the proper baking temperatures, baking time, and different core oven fuels.

Special machinery is being installed in the laboratory for cleaning and recovering old core sand.

In the foundry department there is a melting furnace and appliances for pouring molds so as to test both cores and molds. A room at the rear of the building is fitted with microscopes and cameras for the study of core problems. The working plan of the laboratory is as follows: The demonstration plant is run as a permanent exhibit, the manufacturers paying a definite sum per year for the exhibit privilege and supplying the laboratory with their latest equipment.

OCCUPATIONAL DISEASES IN CHEMICAL TRADES

A committee on Occupational Diseases in the Chemical Trades was appointed by the New York Section of the American Chemical Society in February, 1912. The objects of the committee may be specifically stated as follows:

1. To hold itself ready to advise the Legislature of the States of New York and New Jersey in reference to matters pertaining to occupational diseases in the chemical trades.

2. To study various bills presented in the Legislatures in an effort to avoid unwise legislation, especially that which might be inoperative or ineffective from one or many reasons resulting from lack of technical knowledge at the time of writing the laws.

3. To inaugurate and superintend such investigations as might be decided upon which look toward improvement of conditions of labor in the chemical trades.

The personnel of the committee may be seen by a perusal of the membership, which is given herewith: Dr. Charles Baskerville, professor of chemistry and director of the laboratory, College City of New York, chairman; E. C. Uhlig, chief chemist, Brooklyn Union Gas Company, Brooklyn, N. Y., secretary; Dr. Geo. P. Adamson, Baker and Adamson Chemical Company, Easton, Pa.; W. H. Bassett, technical superintendent and metallurgist, American Brass Company, Waterbury, Conn.; Dr. Wm. F. Doerflinger, consulting chemist, 52 Beaver street, New York City; Dr. H. M. Kaufman, general manager, Mutual Chemical Company of America, 55 John street, New York; Dr. Chas. F. McKenna, chemical engineer, 50 Church street, New York; Dr. A. C. Langmuir, chief chemist, Marx & Rawolle, 9 Van Brunt street, Brooklyn, N. Y.; Dr. Chas. L. Parsons, mineral chemist, Bureau of Mines, Washington, D. C.; Dr. Geo. A. Prochazka, general manager, Central Dye Stuff and Chemical Company, Newark, N. J.; Dr. Geo. D. Rosengarten, Powers, Weightman & Rosengarte, Philadelphia, Pa.; A. H. Sabin, consulting chemist, National Lead Company, 129 York street, Brooklyn, N. Y.

FOREIGN TRADE OPPORTUNITY

(In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.)

No. 10004. Red Copper in Sheets, Bars and Tubing.—The American minister at Bucharest, Roumania, reports that the Roumanian railway authorities are in the market for about 12 tons of red copper in sheets, 13 tons of red-copper perforated bars, and 42 tons of red-copper tubing. Purchases of this character are made with more or less frequency, but only such producers are invited to present bids as have already entered into relations with the "Direction Générale des Chemins de Fer," Bucharest.

GOVERNMENT WANTS

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., April 18, and publicly opened immediately thereafter to furnish at the Navy Yard, Brooklyn, N. Y., a quantity of naval supplies as follows: Sch. 5297, chain, brass coil; hinges, strap, cast bronze; solder, strip. At the Navy Yard, Eastern: Sch. 5294, sockets, key and keyless, bronze; terminals, wrought copper.

Also proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., April 22, 1913, and publicly opened immediately thereafter to furnish at the navy yard, Charleston, S. C., a quantity of copper terminals.

Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office nearest each yard, or to the bureau. T. J. Cowie, Paymaster-General, U. S. N.

ELECTION

The New York Metal Exchange held its annual election on Monday, March 31, 1913. The following ticket was nominated and elected: President, A. B. Hall; vice-president, Edwin Groves; treasurer, Robert L. Crooke. Members of the Board of Managers: B. Hochschild, of American Metal Company, Limited; H. W. Hendricks, of Hendricks Bros., Inc.; E. Baerwald, of Emil Baerwald; W. Parsons Todd, of Quincy Mining Company; Erich Benjamin, of Erich Benjamin; J. H. Lang, of L. Vogelstein & Co.; Charles J. Marsh, of Standard Underground Cable Company; Humphrey D. Bond, of Vivian Bond & Co. Arbitration Committee.—Julius Loeb, B. Elkan, W. Fisher, C. S. Trench, P. R. Jennings. Inspectors of Election: C. H. Bolles, Jr., Fred Steiner, J. J. Archer.

CHANGE IN FIRM

The Finkell-Hachmeister Chemical Company, manufacturing chemists and importers, Pittsburgh, Pa., announce that William T. Finkell, the former vice-president, has sold his stock and withdrawn from the company. The new corporation will be known as the Hachmeister-Lind Chemical Company, and the business will be carried on in more progressive lines. A feature to which special attention will be given is the company's bureau of free information for the benefit of platers who desire assistance in the working of chemicals. Henry C. Hachmeister and Peter H. Lind are the main stockholders in the new company.

D. B. Moyer, manufacturer and jobber of electro-plating, polishing and buffing supplies, Detroit, Michigan, announces that he has taken in a partner and is now conducting business under the name of the Detroit Platers' Supply Company. Mr. Moyer is secretary of the new company.

The molding machine business conducted under the name of Henry E. Pridmore, Chicago, Ill., has been incorporated with a capital stock of $100,000 as Henry E. Pridmore, Inc. The incorporators are: Emily M. Pridmore, Henry E. Pridmore and Charles H. Dummer.

FIRE

A serious fire on March 8 destroyed most of the brass foundry, power house and carpenters' and box shop of the McKinnon Dash Company, St. Catharines, Ontario. However, the company managed to keep things going and were making brass castings on the 13th, and have now just about caught up on orders. The work is being conducted under temporary shelter. The brass foundry equipment is being redesigned and the new plant will be one of the most modern of its kind when completed. The company state, through W. L. Churchill, that the trade was very generous in their offers to assist them, but as they were fortunate enough to save the most of their patterns and other necessary equipment, they were able to carry on their work without the assistance of those who volunteered to aid them.

REMOVAL

The Detroit Testing Laboratory, Detroit, Michigan, announces the removal of its office and laboratories from 1111 Union Trust

Building to the new building, 674-680 Woodward avenue, where with more room and better equipment they will be able to render prompter and more efficient service to their clients.

The address of Dover Laboratory has been changed to 53 East McFarlan street, Dover, N. J. The Dover Laboratory was established in 1868, and does expert analysis, assays and sampling for the trade. Ethelbert Ely is proprietor of the business and has an attractive list of prices now ready for distribution.

FINANCIAL

The report of the National Lead Company for the year ended December 31, 1912, shows net earnings of $2,492,233 against $2,447,347 in 1911. The balance available for common dividends was $786,501, equal to 3.8 per cent. on the common stock, as compared with 3.58 per cent. earned the previous year. The balance sheet as of December 31, 1912, shows total assets and liabilities of $51,864,230, against $50,170,222 in 1911.

INCREASE OF CAPITAL STOCK

The American Silver Company, Bristol, Conn., has increased its capital stock from $250,000 to $400,000.

The Osborn Manufacturing Company, Cleveland, Ohio, has increased its capital stock from $200,000 to $500,000. The increased capital will be used to extend the molding machine business of the company, for which purpose a large addition to their plant has just been completed.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

Buffalo Nipple and Machine Company, Inc., Buffalo, N. Y. Capital, $2,500. To manufacture nipples, pipes and pipe fittings of brass. Incorporators: George Keipper, D. D. Fennell, Colonel E. Van Wie, all of Buffalo.

The American Brass & Plating Company, Louisville, Ky. Capital stock, $8,000. Incorporators: Thomas J. Hines, J. J. Brennan and J. A. McGill, all of Louisville.

Waterbury Standard Tool & Machine Company, Inc., Waterbury, Conn. Capital, $10,000. To manufacture machinery and tools. Incorporators: Jeremiah W. Phelps, Thomas N. Prentice and Emil Hummel, all of Waterbury.

The J. A. Cochrane Brass Manufacturing Company, Cleveland, Ohio. Capital, $10,000. To manufacture plumbing brass goods and supplies. Incorporators: John A. and David H. Cochrane, Joseph A. Meaher and J. Thorpe, all of Cleveland.

Hoevel Sandblast Machine Company, New York. Capital, $300,000. To manufacture sandblast machinery. Incorporators: H. F. Hoevel, F. H. Scantlebury and E. R. Singer, all of New York.

The Imperial Brass Foundry and Manufacturing Company, Painesville, Ohio. Capital, $50,000. To manufacture sheet metal products and make castings in all metals. Incorporators: C. M. Ludlow, R. A. Groch, M. E. Mikes, G. E. Kirkham and A. C. Decker, all of Painesville.

PRINTED MATTER

Trisalyt.—The third edition of the booklet regarding Trisalyt has been issued by the Roessler & Hasslacher Chemical Company. This little book contains, as did its predecessors, full descriptions and directions for the proper use of the salts which are sold by the company under the name of Trisalyts, which are termed "metallic triple salts for electro-plating in brass, bronze, nickel, silver, gold, etc." Send for Booklet B.

Exhaust Systems.—Specifications designed for the construction and operation of exhaust systems for grinding, polishing and buffing wheels have just been issued by the New York State Department of Labor. These specifications have been prepared by William Newell, mechanical engineer of the department, and was brought out with a view to bring about the efficient removel of dust from grinding, polishing or buffing wheels and also to protect the health of the workmen. The specifications will also protect manufacturers from spending their money on useless exhaust systems installed by ignorant and inefficient contractors. Copies may be obtained by addressing the Board of Factory Inspection, New York State Department of Labor.

Lacquers.—G. J. Nikolas & Co., of Chicago, Ill., have set forth the superior qualities of the various kinds of lacquers which they manufacture in a recently-issued pamphlet of 32 pages, together with the uses for which they are adapted. Copies may be obtained upon request.

Foundry Supplies: Vulcan Engineering Sales Company, Chicago and New York, have issued catalog No. 3, describing and illustrating the line of foundry supplies manufactured by the Hanna Engineering Works of Chicago, including mold dryers, screen shakers, foundry riddles and Muford molding machines and jolt rammers.

Eye Protectors.—The American Thermo-Ware Company, of New York, have issued a small booklet which gives complete descriptions of the long line of workmen's eye protectors and respirating devices which they manufacture, for the use of people who work in polishing, grinding and buffing rooms. Also for those who are engaged in chemical operations where dangerous fumes are generated. The book also gives general classifications of occupational diseases and harmful substances by W. Gilman Thompson, of Cornell University Medical College. Copies may be obtained by writing for Booklet "I."

Platers' Equipment.—The Bennett-O'Connell Company are issuing the following new Bulletins: No. 110, on their EXCEL-ALL Mechanical Plating Barrel. No. 112, on their Concord Prepared Salts, and a new No. 102 on their EXCEL-ALL Ball Bearing Polishing Lathes.

Sherardizing.—The latest and most up-to-date information about sherardizing is contained in a new catalog entitled "About Sherardizing," just issued by the United States Sherardizing Company, New Castle, Pa. The catalog contains complete descriptions of the working process and also gives a comprehensive list of the various concerns who have adopted the process of sherardizing under license.

Brasses.—The Ajax Metal Company, Philadelphia, Pa., have issued a handsome catalog of ninety-two pages which they call Logging Car and Locomotive Brasses. This book is said to be the first piece of printed matter devoted exclusively to logging camps, and for this reason and in its character it is an innovation. The book contains fine half-tone cuts and mechanical drawings of car and locomotive brasses, ingot and babbitt metals and castings used particularly in the lumber trade. The catalog is also a handbook of valuable data and information on logs, lumber, track laying, rails, weights of cars and materials, grades, etc. There are also perforated pages at the back upon which measurements for necessary castings may be entered and mailed with customer's order. The work will be sent to any one interested by asking for catalog M.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, April 7, 1913.

COPPER.

In writing about the copper market a month ago we said, on March 10, "The worst seems to be known about the copper market, and after a decline to around 14½ cents the market today is fairly well established at 14¾@15 cents." This statement just about covered the copper situation. The market during the latter part of the month of March gradually became firmer. The only unsettling feature came from Europe when Germany announced her war budget of 250 millions; all financial markets became unsettled and the London speculative market in standard copper turned weak and lower. With the Balkan war just about over and the German Emperor apparently a little less scared than he was a week or so ago, financial markets in Europe are now in better shape and the London market about £3 higher for standard copper. The copper market here, the last few days in March, is very much stronger. Sales of Electrolytic were made during the month as low as 14.70, later 14.80 was paid, and a big business was done during the last week in March at from 14.80 to 15⅛ cents per pound up to Saturday, March 29. Europe was a heavy buyer and home consumers came in quite freely; it is estimated that between 40 and 50 million pounds of copper have been sold from the 27th to the 31st of March. At the close of the month the market is strong at 15¼ cents for Electrolytic.

The exports for the month have been heavy at around 41,000 tons, or over 93,000,000 pounds. This does not mean European consumption, but the copper is sent abroad to be ready for the improved business that will start up in the near future. The stocks as shown by the Copper Producers' Association show a heavy decrease for the month of March.

TIN.

The tin market in London suffered from the German-French war scare, and prices in London went off several pounds, and prices here declined from around 48 cents at the opening to 46.50, the low point in the month, closing at 48 cents at the end of March. The consumption was very heavy, the deliveries being 5,900 tons.

LEAD.

There was no change in the price of lead during March—Trust price, 4.35 New York, 4.20 East St. Louis. The trust was reported to have shaded this price at times, and it is very likely they did. We shall soon know what the new duty is going to be The chances are that the London market will advance in proportion as the duty here is reduced.

SPELTER.

The spelter market has become weak and lower again and 5¼ cents St. Louis was said to be the market aimed for. The market went off to around 5.70 or 5.65, and the consumers seemed interested in the market, and the manipulators got scared. The market today is firmer and about 15 to 20 points above the lowest at close to 6 cents New York or 5.80 East St. Louis.

ALUMINUM.

The market holds very steady at around 26¾ to 27 cents, according to delivery. The foreign makers are pretty well sold up and are not free sellers.

ANTIMONY.

Market has been very dull and while Cookson's is unchanged at 9 cents, Hallet's is easier at 8½ cents, with Hungarian grade at around 7¾ cents.

SILVER.

The silver market has been weak and unsettled and from 2 to 3 cents per ounce lower for the month at 57¾ cents New York and 26½*d*. in London.

PLATINUM.

The platinum market has held steady at around $51 for hard and $46 for ordinary refined.

QUICKSILVER.

The market is rather easier at $39 per flask against the wholesale price of $40 a month ago.

SHEET METALS.

Sheet copper market has been dull at around 21 to 21½ cents base, while some of the mills have been holding for 22 cents. Copper wire has been sold at around 16 cents, and at the end of March the market seems to be a shade stronger with the better copper market, and some makers are asking 16½ cents. Seamless brass tubing 20 cents base, and seamless copper tubing 23 cents base.

OLD METALS.

The old metal market is inclined to be rather firmer for all kinds of copper scrap, and there is more demand from Europe. The market looks better and is more active than a month ago.

MARCH MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	15.25	14.75	15.00
Electrolytic	15.25	14.70	15.00
Casting	15.10	14.60	14.75
TIN	48.50	45.70	47.00
LEAD	4.35	4.35	4.35
SPELTER	6.50	6.00	6.25
ANTIMONY (Hallett's)	9.00	8.50	8.70
SILVER	59⅝	56⅝	57.88

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		April 8, 1913.
Stocks of marketable copper of all kinds on hand at all points in the United States, March 1, 1913..		122,302,198
Production of marketable copper in the United States from all domestic and foreign sources during March, 1913		136,251,849
		258,554,047
Deliveries:		
For domestic consumption	76,585,471	
For export	77,699,306	
		154,284,777
Stocks of marketable copper of all kinds on hand at all points in the United States, April 1, 1913...		104,269,270
Stocks decreased during the month of March		18,032,928

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.:

1912—Average for year, 16.70. 1913—January, 17; February, 15.50; March, 15⅛.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

Metal Prices, April 8, 1913

METAL PRICES.

	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free. Manufactured 2½c. per lb.	
Lake, carload lots	15.25
Electrolytic, carload lots	15.25
Casting, carload lots	15.00
TIN—Duty Free.	
Straits of Malacca, carload lots	47.50
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.35
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	6.00
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots, f. o. b. factory	25.20
100 lb. lots, f. o. b. factory	23.20
Ton lots, f. o. b. factory	22.20
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	9.00
Hallett's cask lots	8.50
Hungarian grade	7.85
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity ... 40 to	.45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	2.00
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.95
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb	.56
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	46.00
SILVER—Government Assay Bars—Duty free	.59

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% ..... according to quantity	27 to 32
Silicon Copper, 20% ..... " "	34 to 36
Silicon Copper, 30% guaranteed " "	36 to 38
Phosphor Copper, guaranteed 10% ..... " "	23 to 27
Phosphor Copper, guaranteed 15% ..... " "	24 to 28
Manganese Copper, 25% ..... " "	27 to 30
Phosphor Tin, guaranteed 5% " "	60 to 63
Phosphor Tin, no guarantee.. " "	53 to 60
Brass Ingot, Yellow ..... " "	10½ to 11
Brass Ingot, Red ..... " "	13 to 15
Bronze Ingot ..... " "	14½ to 14¾
Manganese Bronze ..... " "	18½ to 20
Phosphor Bronze ..... " "	13 to 16
Casting Aluminum Alloys .... " "	26 to 28

PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
13.75 to 14.00	Heavy Cut Copper	14.75 to 15.00
13.50 to 13.75	Copper Wire	14.25 to 14.50
12.00 to 12.25	Light Copper	12.75 to 13.00
12.00 to 12.25	Heavy Mach. Comp	12.75 to 13.00
8.50 to 8.75	Heavy Brass	9.50 to 9.75
7.00 to 7.25	Light Brass	8.00 to 8.25
8.00 to 8.25	No. 1 Yellow Brass Turnings	8.50 to 8.75
11.00 to 11.50	No. 1 Comp. Turnings	11.00 to 12.00
3.75 to ——	Heavy Lead	—— to 4.25
5.50 to ——	Zinc Scrap	—— to 5.50
10.00 to 12.00	Scrap Aluminum Turnings	12.00 to 14.00
15.00 to 19.00	Scrap Aluminum, cast, alloyed	17.00 to 20.00
20.00 to 22.00	Scrap Aluminum, sheet (new)	21.00 to 22.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

PRICES OF SHEET COPPER.

BASE PRICE, 21 Cents per Lb. Net.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 ins.	"	"	½	1	2	3	5	7	—
	Longer than 120 ins.	"	"	1	1½					—
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			—
	Longer than 120 inches.	"	1	2	3					—
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	—
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			—
	Longer than 120 inches.	"	1	3	6					—
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	—
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			—
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					—
	Longer than 120 inches.	1	2	4	8					—
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					—
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					—
	Longer than 120 inches.	1	3	8						—
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						—
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						—
	Longer than 120 inches.	3	5	9						—
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 ins.	4	6							—

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

	Cents per lb.
ZINC—Duty, sheet, 1⅝c. per lb.	
Carload lots, standard sizes and gauges, at mill	8.00 less 8%
Casks, jobbers' prices	8¾
Open casks, jobbers' prices	9¼

Metal Prices, March 10, 1913

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect March 1st, 1913, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15⅛	$0.16⅛	$0.18
Wire	.14⅞	.16⅜	.18
Rod	.14⅞	.17⅝	.19
Brazed tubing	.19½	—	.22¾
Open seam tubing	.18¾	—	.20¾
Angles and channels, plain	.18¾	—	.21¼

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass	1⅛c.	" " " "
Wire —Extra spring and brazing wire	⅛c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16⅝	$0.18⅛	$0.19¼
Wire	.16⅛	.18⅛	.19¼
Rod	.16⅛	.18⅞	.20¼
Brazed tubing	.20⅝	—	.24
Open seam tubing	.19⅝	—	.22
Angles and channels, plain	.20	—	.22½

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass	1⅛c.	" " " "
Wire —Extra spring and brazing wire	⅛c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

16½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	21½c. per lb. base
100 lbs. to 300 lbs. in one order	22c. " " "
Less than 100 lbs. in one order	23½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	69

Discount 50 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	17½c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	15½c.	" "
" " " Rectangular sheets other than Sheathing	18c.	" "
" " " Rod	15½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 24½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier	3-30	33c.	34c.	36c.	38c.
	3-30	34c.	35c.	37c.	39c.
21 to 24 inclusive	30-48	36c.	37c.	39c.	41c.
	48-60	39c.	40c.	42c.	44c.
25 and 26	3-30	35c.	36c.	38c.	40c.
	30-48	37c.	38c.	40c.	42c.
27	3-30	36c.	37c.	39c.	41c.
	30-48	39c.	40c.	42c.	44c.
28	3-30	37c.	38c.	40c.	42c.
	30-48	40c.	41c.	43c.	45c.
29	3-30	38c.	38c.	41c.	43c.
	30-48	42c.	43c.	45c.	47c.
30	3-30	38c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. Charges made for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	19	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	15	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	20	20	26	30	56
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb.	33	33½	33½	34	34½	35	35½	36	37	38	39	44	47

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19,	B. & S.	Gauge,	inclusive	$0.60
6 "	" " 19,	"	"	"	.70
9 "	" " 19,	"	"	"	.85
12 "	" " 19,	"	"	"	1.00
15 "	" " 19,	"	"	"	1.15
16 "	" " 19,	"	"	"	1.20
18 "	" " 19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.